

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 20

AUGUST, 1937

NUMBER 8

BILATERAL PARTIAL COLOBOMATA OF THE OPTIC NERVE*

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Complete colobomata of the optic nerve or optic-nerve sheaths offer very little difficulty in diagnosis and are therefore of interest only as unusual congenital anomalies. The enormous size of the discs or of what corresponds to the disc, the deep cup, and the dead white pallor usually suggest the condition at once. In

of such cases and called attention to the difficulties in diagnosis.

The present case is reported to illustrate the importance in keeping this condition in mind. The patient, Mr. L. G., aged 24 years, was referred to Dr. Francis Grant with the diagnosis of a possible pituitary tumor. For the past year he had

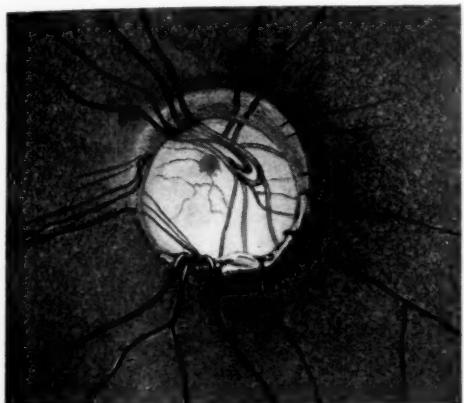


Fig. 1 (Adler). Right eye.

Colobomata of the optic-nerve entrance.



Fig. 2 (Adler). Left eye.

addition in these cases there are usually colobomata of the choroid, associated with the defect of the disc, which should leave no doubt as to the correct diagnosis. Not all colobomata of the optic nerve are complete, however, and occasionally one may see a case which is difficult to diagnose because the picture is not complete. A number of authors have published reports

been having dizzy spells and occasional headaches. Glasses had been worn for a number of years and had been changed eight months ago by an optometrist.

The patient was thought to have a bilateral optic atrophy, and X-ray studies had shown some enlargement of the sella. Similar X-ray studies made at the University Hospital failed to confirm this, and Dr. Grant referred the patient to me for an examination of his eyegrounds.

Vision with correction was 6/6—. The muscle balance and near-points were

* From the Department of Ophthalmology, University of Pennsylvania. Read at the Section on Ophthalmology of the College of Physicians, April 15, 1937.

normal. The anterior segments were normal in every respect. The tension in each eye was 16 mm. Hg (Schiötz). The pupils were equal and reacted promptly to light and in convergence. The ophthalmoscopic examination of the right eye showed the media to be clear. The disc was about half again the normal size. The upper half was round and well outlined, the lower half was irregularly shaped and bordered by scattered choroidal pigment. The vessels at the upper pole emerged from a point within the disc surface. At the lower border the vessels dipped under a very sharp edge and disappeared to emerge again from the bottom of a very deep cup. The retinal level at the lower border of the disc was zero, and the bottom of the disc was —5. D. The upper portion of the disc was of good color, whereas the whole lower half was very pale. The markings of the lamina were evident where the main vessels come into the disc. The macula was healthy. The blood vessels were normal. One-half disc diameter below the lower edge of the disc

was a small area of choroidal atrophy underneath the inferior temporal vein, and in the extreme periphery below there were similar areas of retinal atrophy. In the extreme upper periphery was a linear area of retinal or choroidal pigment. Other than these, no lesions were seen. In the left eye the disc was similar. No lesions in the periphery could be seen through an undilated pupil.

Form fields showed a complete loss of the upper halves of both fields, the line of demarcation between seeing and blind halves just escaping the macula. There were no scotomata in the remaining fields.

The normal tension and the character of the fields, plus the ophthalmoscopic appearance were sufficient to rule out glaucoma. An optic atrophy could not give a field picture such as this. The size of the disc, the deep cup, the color and pigmentation at the margins, all point to a diagnosis of partial coloboma of both optic nerves.

Hospital of the University of Pennsylvania.

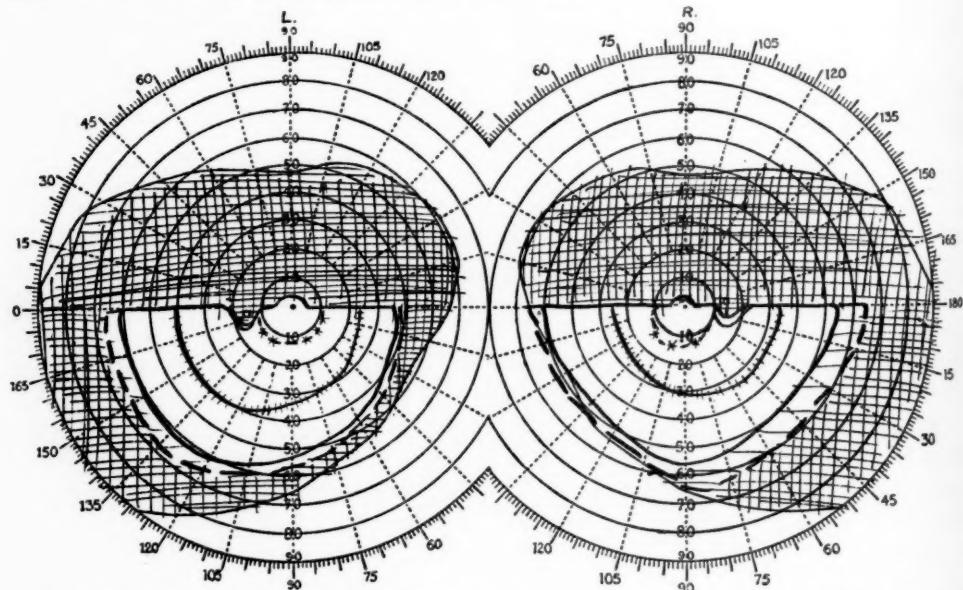


Fig. 3 (Adler). Visual fields in a case of bilateral partial colobomata of the optic nerve. Solid line, 1° white; broken line, 2° white; ladder line, 1° red; cross line, ½° red. Vision with correction was L.E. 6/6? R.E. 6/6 — 2.

STUDIES ON THE OXYGEN CONSUMPTION OF THE RABBIT LENS AND THE EFFECT OF 2-4 DINITROPHENOL THEREON*

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INTRODUCTION

Techniques of sufficient delicacy to demonstrate the metabolic processes of the lens have been developed only recently. Consequently, the interest of the earlier investigators centered upon the optical properties of this organ and there have been relatively few investigations of its metabolism. Perhaps the first important work on this subject was that of Wagenmann (1890), which showed that the integrity of the lens depends upon a continuous supply of oxygen or of nutrients or of both, since ligation of the posterior ciliary arteries resulted in permanent histologic changes. Direct evidence of oxygen consumption by the lens was afforded by the work of Mashimo (1923), Adams (1925), Schmerl (1927, 1929), and of Kronfeld and Bothman (1928). It has also been shown that both

aerobic and anaerobic glycolysis occur in the lens (Kronfeld and Bothman, 1928; Cohen and Killian, 1929; Fischer, 1931, 1934; Michail and Vancea, 1932).

The finding that energy-yielding reactions such as oxygen consumption and glycolysis are essential for the continuance of the integrity of cells which do no external work, for example, nucleated red blood corpuscles, ova, cells of the central nervous system and of the lens, illustrates the fact that the significance of such reactions is not confined to activity. Warburg (1914) has pointed out that the maintenance of the cell in the living state requires the performance of work in ways that are invisible but indispensable. This work may be required to maintain the structure of the cell in the sense of preventing mixing of constituents by diffusion and to maintain certain properties of cell membranes, such as selective permeability, as well as in other ways (cf. Bayliss, 1924). From this point of view the energy-yielding reactions might be

* From the Department of Physiology. Supported in part by Grant 400 of the Committee on Scientific Research of the American Medical Association.

considered intracellular homeostatic agencies.

The present investigation developed from the following considerations: Since it has been shown that interference with lens metabolism may lead to the development of cataract (cf. Bourne's review, 1937) and since it has been shown that the therapeutic administration of 2-4 dinitrophenol (DNP) is followed by the development of cataract in a small percentage of cases (cf. references under heading 2. DNP-cataract), it is important to study the action of DNP on the metabolism of the lens as a background for an investigation of the etiology of such cataracts. The present investigation is sharply limited in scope. Briefly, it was designed to supply quantitative information concerning the oxygen consumption of the lens and the effect of DNP thereon and to compare the action of DNP on lens respiration with its action on the respiration of other tissues. DNP might have an unusual effect quantitatively upon the respiration of the lens in at least two ways which could be of interest in connection with the etiology of "DNP cataract." First, the optimum concentration of DNP for the stimulation of lens respiration might be considerably lower than that for other tissues, so that the usual therapeutic dose (3 mg. per kg.), which stimulates the oxygen consumption of the body as a whole, would depress that of the lens, since it has been shown that concentrations of DNP above the stimulating range are inhibitory (cf. Field, Martin, and Field, 1934, 1935; Field and Tainter, 1936). This would lead to conditions resembling in some respects those obtaining after ligation of the posterior ciliary arteries. In both cases oxygen consumption would be greatly reduced; in the former case by interference with utilization, in the latter by interference with supply. Second, the degree of response of the lens to DNP might be

greater than that of other tissues so that the end-products of metabolism might accumulate more rapidly than they could be removed. One might expect metabolic disturbances in consequence. These hypotheses were tested experimentally by measuring the effect of graded concentrations of DNP on the oxygen consumption of the excised rabbit lens.

METHODS

1. The Experimental Animal

As the respiratory rate of the lens is low (cf. Kronfeld, 1933), it is necessary to choose a fairly large animal if the oxygen consumption of single excised lenses is to be measured. Therefore young white rabbits were used. They were of both sexes and varied in weight from 850 to 1,200 gm. They were not from a genetically pure stock. About 100 animals were used.

2. Removal of Lens from the Eye

The rabbits were killed by a blow on the back of the neck. The eyeball was removed and opened by cutting about 2 mm. behind the sclerocorneal junction. This section was posterior to the attachment of the fibers of the zonula ciliaris to the ciliary body, and therefore permitted a posterior approach to the lens. The zonula fibers were dissected away, great care being used to avoid damage to the lens capsule. The excised lenses were placed at once in respirometers and equilibrated for an hour in an atmosphere of oxygen at the temperatures given in the several tables and legends.

3. Measurement of Respiration

Measurements of oxygen consumption were made by the use of Barcroft differential respirometers. Four of these were available. The respirometer vessels were of about 7 c.c. capacity and were of the conventional Warburg form (see Rich-

ardson, 1929; drawing on p. 70). Each unit had been calibrated with mercury in the usual way (Dixon, 1934). Redistilled kerosene rather than Brodie's fluid was used in the manometers to give increased sensitivity.

In all runs each of the four experimental vessels contained a lens bathed in mammalian Ringer's, which was buffered at pH 7.2 with M/150 phosphate and contained 0.2-percent glucose unless otherwise noted. The volume of fluid in the experimental vessels was 0.80 to 1.00 c.c. The four compensation vessels contained sufficient Ringer's solution to make the fluid volume uniform. Each central well contained 0.10 c.c. of 5-percent sodium hydroxide to absorb carbon dioxide. Measurement of respiration was commenced at the end of the 60-minute equilibration period. In all cases a 60-minute control period followed the equilibration period and preceded the addition of reagents, so that each lens served as its own control. Long-time controls were provided by the experiments in which the solution added from the sidearms of the vessels was Ringer's rather than DNP. Reagents were added from sidearms at the times and in the concentrations indicated in the several legends and tables. Such additions were made simultaneously in the experimental and compensation vessels.

The respirometers were mounted on a shaking device quite similar to that described by Dixon (1934). The rate and amplitude of shaking chosen represented a compromise. Kronfeld and Bothman (1928) in their valuable paper reported that damaged lenses have an abnormally high respiratory rate and recommended "careful and prudent shaking" to avoid mechanical injury. We found high respiratory rate a usual but not an invariable concomitant of traumatic injury to the lens. However, although slow shaking de-

creases the chance of mechanical injury, it involves other difficulties. The equations commonly used in the calculation of oxygen consumption under these conditions are based on the assumption that the fluid in the respirometer vessels is saturated with the gases of the gas-space (Warburg, 1926), a condition favored by rapid shaking. Saturation of the suspension fluid with oxygen and rapid elimination of carbon dioxide are perhaps especially important in experiments on the intact lens for the following reasons: The "maximum permissible thickness" (Warburg, translated by Dickens, 1931, p. 80) for a tissue having the respiratory rate of the average lens (tables 2, 3) under the conditions of these experiments is approximately 1.45 mm. If the tissue is thicker than this the parts most distant from the surface will receive little or no oxygen and the respiratory rate observed will be misleading. All the lenses used in the present experiments had a greater equatorial thickness than this. While the fact that the oxygen consumption of the lens is localized in the cortex (table 1) mitigates this difficulty, nevertheless only the external border of the cortex is exposed to the oxygen-containing fluid. It is therefore difficult to assess the oxygen supply of the inner elements of the cortex. We finally chose a shaking rate of approximately 100 cycles per minute, with an amplitude of 5 cm., and discarded results when subsequent inspection showed that the lens had been damaged.

Results are given in cubic millimeters of oxygen (N.P.T.) per gram wet weight of lens. When the results are expressed as rates they are given in cubic millimeters of oxygen (N.P.T.) per gram wet weight per hour. This quantity is called Q_{O_2} . This method of expression permits direct comparison of the oxygen consumption of the lens with that of other tissues on a unit weight basis, but the lack of homogeneity

of the distribution of metabolic activity in the lens must be borne in mind when such comparisons are made (cf. Kronfeld, 1933). It would, of course, be desirable to determine separately the respiratory rates of the several regions of the lens, and to compare these values (on a unit-weight basis) with those of other tissues. However, such measurements were not feasible with the apparatus at our disposal.

Variation in wet weight of lenses during an experiment was small and irregular. This may be considered evidence of satisfactory osmolar concentration (that is, concentration of osmotically active units, including both ions and molecules—E. J. Warburg, 1922) of the fluid bathing the lens. Since the wet weight did not change appreciably (less than 5 mg.), most weighings were made after experiments to minimize handling before measurement of respiration. Wet weights were determined with a Roller-Smith microtorsion balance after removal of superficial moisture. This procedure required only a few seconds.

RESULTS

1. Studies on the Oxygen Consumption of the Excised Lens

No investigations of the respiration of the lens using sufficient numbers of lenses to permit satisfactory statistical treatment have appeared in the literature. The experiments reported in this section were designed to correct this deficiency and to provide a background for the subsequent study of the effect of DNP on the oxygen consumption of the lens.

a. *Basis for expression of results. Wet weight—dry weight relations.* Appreciation of the importance of water as a protoplasmic constituent would lead one to compute the oxygen consumption of tissues on the basis of wet weight, and many recent findings are so expressed (Shaffer,

Chang, and Gerard, 1935; DuBois, 1936). However, dry weight can be determined more accurately than wet weight (Warburg, 1926) and is perhaps less variable—considerations which have led many to relate their findings to dry weight. As has been pointed out, it is somewhat misleading to express the oxygen consumption of the lens as a function of either wet or dry weight because metabolic activity is not uniformly distributed in this organ. However, no better basis suggests itself. Our results, based on wet weight, can easily be converted to a dry-weight basis. When 17 lenses were dried in an electric oven at 110°C. for 18 hours (which was found sufficient to ensure constant weight), the mean dry weight/wet weight ratio was 0.307. Values of this ratio ranged from 0.272 to 0.325. The standard deviation was 0.014 and the Pearsonian coefficient of variation 4.56. The percentage of cases included within the mean plus and minus standard deviation was 70.5. Wet weights in this series ranged from 0.183 to 0.263 gm., mean 0.232 gm., and the dry weights from 0.0593 to 0.0825 gm., mean 0.0712 gm. The 69.3-percent average water content of the 17 lenses in this series is definitely higher than the 59.25 percent reported by Salit (1931) for the adult rabbit lens (average of two cases). However, at least in some species, there is a progressive decrease of water content of the lens with age (Salit, 1931). While our rabbits were all young they varied in weight from 850 to 1,200 gm., hence the difference just noted is probably in part attributable to the effect of age.

Differences of paired lenses in wet weight. We could find no statistical study on this subject for the rabbit lens (cf. O'Brien and Salit, 1933). The differences in wet weight between paired lenses (that is, lenses from the same rabbit) ranged from 0.0 to 34.2 mg. in a series of 37

pairs. The mean difference was 7.3 mg., the standard deviation of the difference 6.7 mg.; 83 percent of the cases lay within the limits set by the mean plus and minus standard deviation. In this series the mean lens wet weight was 215 mg. (0.215 gm.). Hence the mean difference in wet weight between pairs was 3.4 percent of the mean wet weight.

b. *Oxygen consumption of the lens in various media.* As a basis for subsequent work, the oxygen consumption of the excised rabbit lens was studied in three different solutions; namely, nonnutritive Ringer's, Ringer's—0.2-percent glucose, and Ringer's—0.2-percent lactate. All were buffered at pH 7.2 with M/150 phosphate. Typical findings are presented in figures 1, 2, and 3.

It is shown in figure 1 that addition of glucose to nonnutritive Ringer's solution bathing the lens did not change the ratio of oxygen consumption, even after four hours of "starvation" (cf. Quastel and Wheatley's method for determining the utilization of oxidative substrate, 1932). Figures 1, 2, and 3 illustrate that the decrease in oxygen consumption was not marked when the lens was bathed in any one of these solutions. It is shown in figure 3 that the oxygen consumption of a lens bathed in Ringer's-lactate (curve I) was approximately the same as that of its mate bathed in Ringer's-glucose solution. In view of these findings it is concluded that neither exogenous glucose nor exogenous lactate affected the oxygen consumption of the excised rabbit lens under the conditions of these experiments. Either these substances were not used as oxidative substrate by the lens or the concentration of endogenous fuel stuffs was too great to permit summation of effect on addition of further substrate (cf. Krebs, 1935).

c. *Comparison of the respiration of the cortex and nucleus of the lens.* It is com-

FIG. 1.

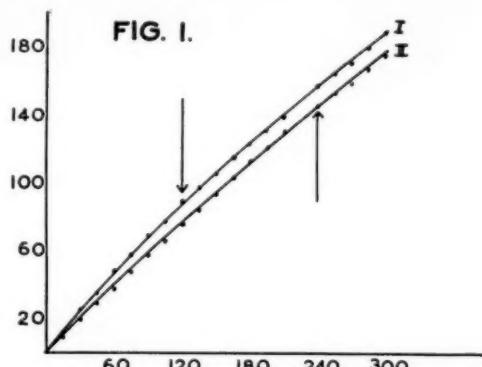


FIG. 2.

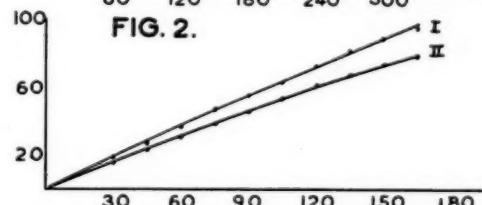
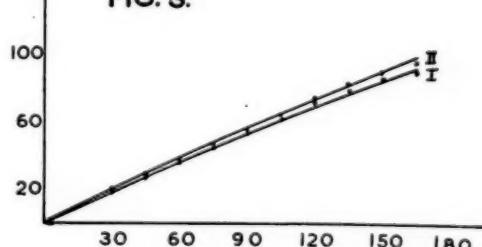


FIG. 3.



Figs. 1, 2, 3 (Field, Tainter, Martin, and Belding). Integral curves showing total oxygen consumed by rabbit lenses in cu. mm., N.P.T., per gram wet weight (ordinates) as a function of time in minutes (abscissae). pH 7.2, 30°C.

Fig. 1. Two lenses in nonnutritive Ringer's. Glucose added at times indicated by arrows. Final glucose concentration, 0.2 percent.

Fig. 2. Two lenses in Ringer's—0.2-percent glucose from beginning of experiment.

Fig. 3. Curve I, lens in Ringer's—0.2-percent lactate; Curve II, lens in Ringer's—0.2-percent glucose; from beginning of experiment. Paired lenses (that is, lenses from same rabbit).

monly stated that the nucleus of the lens shows little or no oxygen consumption (cf. Kronfeld, 1933). As far as we know, the only evidence for this view is that provided by Schmerl's (1927) two experiments on the respiration of the nucleus of the dog's lens. Therefore it seemed worthwhile to investigate this point fur-

TABLE 1
COMPARISON OF THE RESPIRATION OF THE
CORTEX AND NUCLEUS OF THE RABBIT LENS.
RINGER'S-GLUCOSE, pH 7.2, AT $30^{\circ} \pm 0.01^{\circ}\text{C}$.

Animal No.	Tissue	Weight (gm.)	O ₂ Consumed cu. mm. N.P.T. 1st hour
70	Right lens	0.192	7.09
	Left lens	0.190	—
	Left lens nucleus	0.0382	nil
71	Right lens	0.190	5.22
	Left lens	0.193	—
	Left lens nucleus	0.0382	nil
72	Left lens	0.190	—
	Left lens cortex	—	3.20
	Left lens nucleus	0.0250	nil

ther. The results of this study are presented in table 1.

It is shown in table 1 that the respiration of the nucleus of the rabbit's lens is either nil or is not measurable under the conditions of these experiments. More delicate methods might reveal that the nucleus does consume oxygen, but it is

fair to conclude at least that the respiratory rate of the nucleus is low in comparison with that of the cortex. It should be noted that the oxygen-consumption figures given in table 1 are taken directly from the readings of the respirometers and are not based on unit weight.

d. *Relation between lens respiration and lens weight.* When Q_{O_2} (calculated from 60-minute readings) was plotted as a function of lens wet weight (W) for lenses in Ringer's-glucose at $30^{\circ} \pm 0.01^{\circ}\text{C}$, a definite negative correlation was found. This is illustrated in figure 4 (44 cases).

It is shown in figure 4 that the dispersion of Q_{O_2} is heteroscedastic* (that is, the standard deviations of the successive "y" arrays [W] are not equal—in this case greater for the lower values of "y"). This condition would probably not affect any parameter except the standard error of estimate.

* Kelly, T. Statistical method. New York, The MacMillan Co., 1923, p. 172.

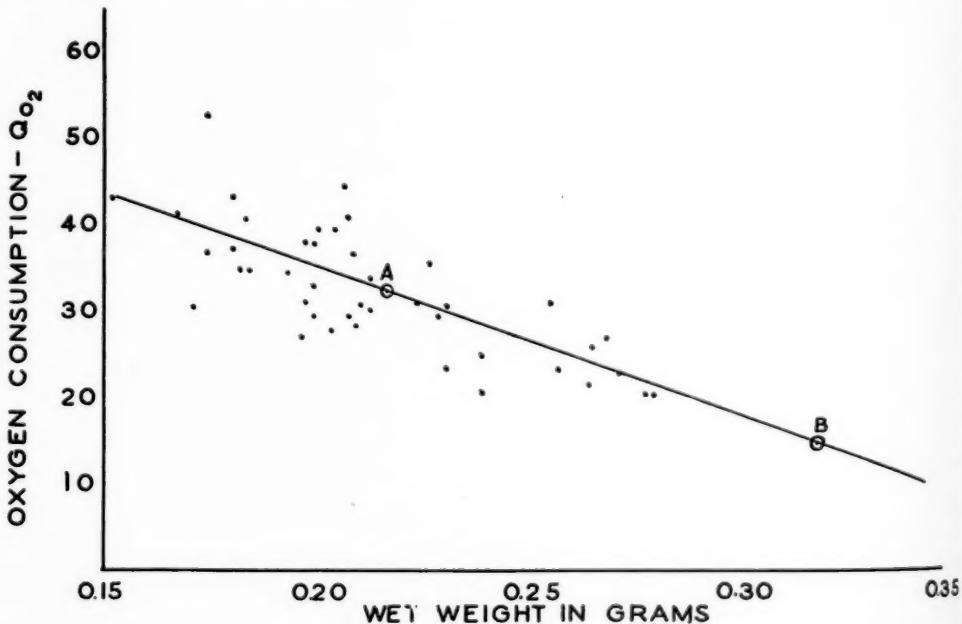


Fig. 4 (Field, Tainter, Martin, and Belding). Scatter chart showing Q_{O_2} of 44 young rabbit lenses as a function of lens wet weight in grams (W). AB represents the regression of Q_{O_2} on W . Lenses in Ringer's-0.2-percent glucose, pH 7.2, 30°C .

For the 44 cases shown in figure 4, the Pearsonian coefficient of correlation was found to be $r = -0.805 \pm 0.053$. Fisher's Z (Fisher, 1934; p. 183), calculated in the usual way, was -1.114 ± 0.1562 . The chance that such a value could be obtained if Q_{O_2} and W were uncorrelated is less than 1 in 100,000,000. It is therefore reasonable to conclude that the Q_{O_2} of the rabbit lens decreases with increase in lens weight.

The significance of this negative correlation of Q_{O_2} and W is not easy to determine. It might be attributable to an effect of age. The lens continuously increases in weight throughout life (O'Brien and Salit, 1933; Bourne, 1937). In some species, at least, this increase in weight is more closely related to age than to the size of the animal (Jess, 1913). Therefore it seems reasonable to conclude that, in general, the heavier lenses in our group came from the older animals (note: none of our animals were full-grown). Pearce (1936) has shown that in a genetically pure strain of albino mice there is significant decrease in the oxygen consumption of excised liver, kidney, and resting ventricular muscle with increase in age. A similar relationship might be found for the rabbit lens even in a heterogeneous group of animals. However, other factors may be concerned in the correlation under discussion. For example, changes in the proportion of cortical tissue (which consumes oxygen) to nuclear tissue (which does not) may develop with age. Interference with oxygen diffusion might change with age, since the older lenses are larger (cf. discussion under "Methods"). However, the present results at least suggest a decrease in Q_{O_2} of the whole lens with age similar to that found by Pearce for other tissues.

Other statistical findings from this group of experiments are presented in table 2.

TABLE 2
STATISTICAL FINDINGS. WEIGHT AND Q_{O_2} .
SERIES OF 44 RABBIT LENSES IN RINGER'S-
GLUCOSE, pH 7.2 AT $30^\circ \pm 0.01^\circ C$.

	W*	Q_{O_2}
Mean	0.216	32.1
Standard deviation	0.035	7.4
Range	0.152-0.333	20.3-52.8

* W = wet weight in gm.

e. *Oxygen consumption of paired lenses in Ringer's-glucose.* In a series of 19 pairs of lenses the differences in Q_{O_2} between members of the pairs ranged from 0.00 to 10.65 (first-hour measurements, lenses in Ringer's-glucose at $30^\circ \pm 0.01^\circ C$). The mean Q_{O_2} of all lenses in this series was 31.1, the mean of the difference in Q_{O_2} between paired lenses was 3.45, the standard deviation of the distribution of this difference was 2.56. The percentage of observations included within the mean plus and minus standard deviation was 73.6.

f. *Daily oxygen consumption of the average rabbit lens.* In the series of seven cases reported in table 3 the mean volume of oxygen consumed per lens in Ringer's-glucose at $37^\circ \pm 0.01^\circ C$. was 8.17 cu. mm. (N.P.T.) per hour (first hour). If this rate of oxygen consumption be assumed to be the same as the rate *in vivo*, the oxygen consumption of the average rabbit lens (young animals) at $37^\circ C$. in 24 hours would be 0.1961 c.c. (N.P.T.). This corresponds to an oxygen consumption of 0.00028 gm. per 24 hours, which agrees very well with the figure of 0.0003 gm. cited by Kronfeld (1933).

g. *Comparison of present with previous findings on the oxygen consumption of the rabbit lens.* It is interesting to compare the results obtained in the present investigation with those of others who have studied the oxygen consumption of the rabbit lens. Such a comparison is shown in table 3. The earlier data presented here were taken from Kronfeld's

TABLE 3
COMPARISON OF THE RECORDED DATA ON THE OXYGEN CONSUMPTION OF THE RABBIT LENS.

Observer	Temp. °C.	Method	Surrounding Fluid and Gas	O ₂ Consumption per Hour/Lens
Mashimo, 1923	14°-20°	Winterstein respirometer	Normal saline or Ringer's O ₂	6-9 c.mm.
Schmerl, 1927	37.5°	Warburg manometric method	Ringer's, CO ₂ absorbed air	4 c.mm.
Kronfeld and Bothman, 1928	37.°	Warburg manometric method	Ringer's, CO ₂ absorbed air	"Smallest values" 4-8 cu.mm.
		differential method	Ringer's-glucose 5% CO ₂ O ₂	Greatest values about 30 cu.mm.
Schmerl, 1929	37.5°	Warburg manometric method without shaking	Blotting paper soaked with Ringer's O ₂	13-26 cu.mm. depending on size of respirometer
Field, Tainter, Martin and Belding, 1937	30°	differential method	Ringer's-glucose, CO ₂ absorbed O ₂	44 cases Range 4.86-9.20 cu.mm. Mean 6.71 cu.mm. Standard deviation of distribution = 1.02 cu.mm.
	37°	differential method	Ringer's-glucose, CO ₂ absorbed O ₂	7 cases Range 5.62-10.58 Mean 8.17 cu.mm.

paper (1933). The oxygen-consumption figures in the literature are based on the individual lens rather than on unit weight. While this is an unsatisfactory method for the presentation of data, since it affords no basis for quantitative comparison of the oxygen consumption of the lens with that of other tissues, our data are presented in the same way in table 3 for comparison.

It is shown in table 3 that the ranges of oxygen consumption per lens per hour in our experiments at 30°C. and at 37°C. are of the same order as those reported by others. The range in our series at 37°C. is somewhat above the "smallest values"

of Kronfeld and Bothman (1928). This may be in part attributable to differences in age, in part to differences in experimental conditions (for example, rate of shaking, and so on).

2. Effect of DNP on the Oxygen Consumption of the Lens

The fundamental investigations of Magne, Mayer, and Plantefol (1931, 1932) have shown that DNP and some related compounds, in proper concentrations, can evoke marked increase in the oxygen consumption of some animals and plants. The work of Hall, Field, Sahyun, Cutting, and Tainter (1933), Dodds and

co-workers (1933, 1934), Heymans and Casier (1935), and others has in general confirmed and extended these observations. Stimulation of the respiration of excised tissue by nitrated phenols has been reported by various investigators, including Dodds and Greville (1933), von Euler (1933), and Handovsky, Casier, and Schepens (1935). The work of Plantefol (1933, 1934, 1935) and of Field, Martin, and Field (1933, 1934, 1935) has shown that nitrated phenols can stimulate the oxygen consumption of yeast. It is evident that these compounds are very general metabolic stimulants.

a. *Action of DNP on respiration of lens in Ringer's-glucose.* It has been shown by Field and Tainter (preliminary communication, 1937) that DNP can stimulate or inhibit the respiration of the excised intact rabbit lens. The present paper is a final report on this subject. The effects of 26 concentrations of DNP (weighed out as the sodium salt), ranging from 0.005 mg. percent ($2.23 \times 10^{-7}M$) to 400.0 mg. percent ($1.78 \times 10^{-2}M$) were investigated. The effects of concentrations lying just below, in, and

just above the stimulating range are presented in table 4.

The values of percentage stimulation and percentage inhibition given in table 4 were calculated from the formulae:

$$\text{percent stimulation} =$$

$$\frac{Q_{O_2} (\text{stimulated}) - Q_{O_2} (\text{control})}{Q_{O_2} (\text{control})} \times 100$$

$$\text{percent inhibition} =$$

$$\frac{Q_{O_2} (\text{control}) - Q_{O_2} (\text{inhibited})}{Q_{O_2} (\text{control})} \times 100$$

The values of Q_{O_2} (control) were calculated on the assumption that had no DNP been added the decrease of Q_{O_2} with time would have been the same as that observed in the long control runs in Ringer's-glucose. Tests of this assumption showed that such predictions were accurate to about ± 5 percent.

The results of the experiments on the action of DNP on the oxygen consumption of the excised rabbit lens in Ringer's-glucose, pH 7.2 at $30^\circ \pm 0.01^\circ C$. can be summarized as follows: Concentrations below 0.05 mg. percent had no effect. The action of 0.05 mg. percent varied with

TABLE 4
EFFECT OF GRADED CONCENTRATIONS OF DNP ON Q_{O_2} OF THE RABBIT LENS. RINGER'S-GLUCOSE, pH 7.2,
TEMP. $30^\circ C \pm 0.01^\circ C$.

Concentration DNP Mg. %	Oxygen Consumption						
	1st Hour (Control Period)		2d Hour		3d Hour		4th Hour
	Q_{O_2}	Q_{O_2}	% Effect	Q_{O_2}	% Effect	Q_{O_2}	% Effect
0.025	34.4	34.4	—				
0.050	34.0	30.0	—				
0.10	29.4	38.5	+36.7				
0.15	37.9	53.9	+48.0				
0.20	36.5	58.0	+65.7				
0.25	41.3	64.0	+61.6	72.3	+82.5	70.0	+76.8
0.30	30.6	39.9	+35.7				
0.50	25.5	26.5	+10.4				
1.00	23.0	25.5	+15.9				
1.25	37.9	42.1	+15.7				
5.00	28.1	28.3	—	26.6	—		
10.00	41.0	30.0	-23.7				
15.00	24.7	23.6	—	20.3	-14.4	11.3	-52.5
20.00	29.8	15.6	-45.5	18.2	-36.4	9.3	-67.5

different lenses: in some instances there was slight stimulation, in others no effect. Stimulation of oxygen consumption was obtained with concentrations ranging from 0.05 to 1.25 mg. percent. The greatest percentage stimulation obtained in any

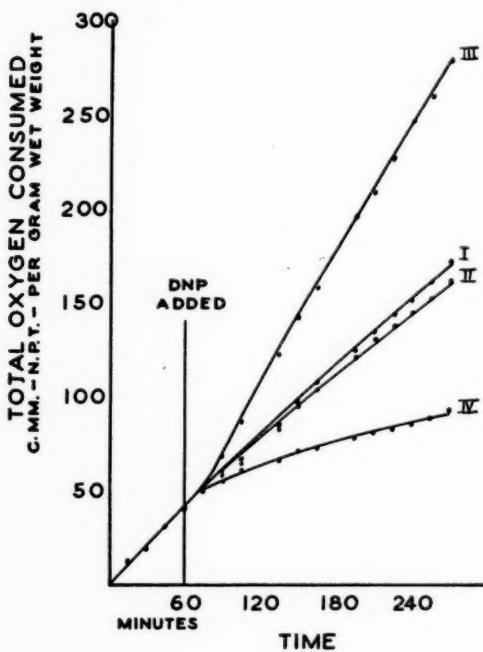


Fig. 5 (Field, Tainter, Martin, and Belding). Integral curves showing the effects of graded concentrations of DNP on total oxygen consumed by 4 rabbit lenses as a function of time. Curves I-II and III-IV represent data from paired lenses (that is, lenses from same rabbit). At 60 minutes reagents were added from side-arm to give the following concentrations of DNP in mg.%: I, 0.0 (control); II, 0.005; III, 0.250; IV, 400.0.

On this scale the curves coincided for the first 60 minutes (common control period). Lenses in Ringer's-0.2-percent glucose, pH 7.2, 30°C.

instance was 110, with 0.25 mg. percent DNP. In successive experiments with any of these concentrations there was considerable variation in the percentage stimulation of the respiration of the different lenses (cf. table 5). This is probably in part due to the use of a group of heterogeneous animals rather than a

genetically standardized stock (cf. Win-ton, 1927; Durham, Gaddum, and Marchal, 1929). The borderline between stimulating and inhibitory concentrations of the drug was rather indefinite, owing to individual variations in the lenses. However, concentrations above 5.0 mg. percent depressed oxygen consumption, although respiration did not cease even after 210 minutes' exposure to 400 mg. percent (cf. fig. 5). Thus the action of DNP on the oxygen consumption of the lens goes through three phases (no effect, stimulation, inhibition) as the concentration increases. This is illustrated graphically in figure 5. These findings constitute a case in point of Clark's (1933) generalization that complex systems usually give polyphasic responses to drugs.

Time relations. It is shown in figure 5 that both stimulation and inhibition of lens respiration by DNP required some time to develop. This is in sharp contrast to the almost immediate onset of action of DNP on the respiration of microorganisms (cf. Field, Martin, and Field, 1934; 1935) and to the rapid development of such action when DNP is injected into the intact animal (cf. Hall, Field, Sahyun, Cutting, and Tainter, 1933). This is one of the causes of difficulty in distinguishing the higher stimulating concentrations from the lower inhibitory ones, since with concentrations of DNP above 5.0 mg. percent an initial period of stimulation preceded the development of inhibition. Accordingly it was necessary to follow oxygen consumption for several hours after addition of DNP to be sure that drug-cell equilibrium had been established. This effect is illustrated in figure 6.

The diphasic response shown in figure 6 may be considered to measure the rate at which the concentration of DNP within the lens rose from zero through the stimulating to the inhibitory range. This rate would be a function of the rate of diffu-

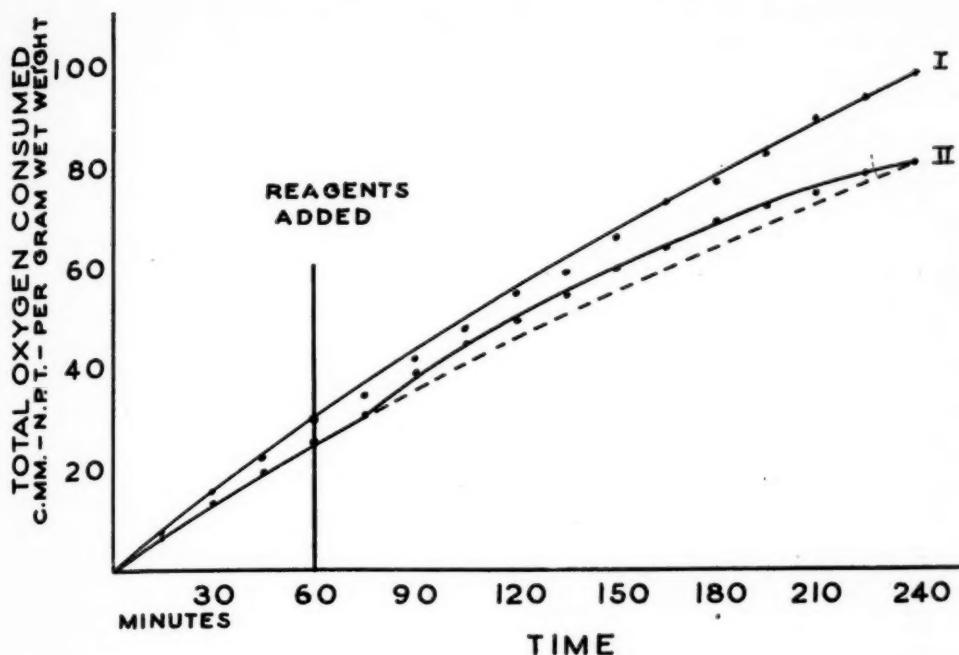


Fig. 6 (Field, Tainter, Martin, and Belding). Graph illustrating the diphasic response of oxygen consumption of a rabbit lens to a concentration of DNP low in the inhibitory range. Curve I, control; Curve II, 15-mg. percent DNP added at 60 minutes. Broken line represents extrapolation of control period, Curve II. Lenses in Ringer's—0.2 percent glucose, pH 7.2, 30°C.

sion of the drug through the capsule and into the several regions of the lens cortex. Further evidence of the importance of the capsule in delaying the onset of DNP action is afforded by experiments on lenses ground in an agate mortar and then suspended in Ringer's-glucose. These are illustrated in figure 7, in which it is shown that previous destruction of the lens capsule reduced the lag in development of DNP action observed in figures 5 and 6.

b. Action of DNP on respiration of lens in Ringer's-lactate. It has been shown that the oxygen consumption of the rabbit lens in Ringer's-lactate is the same as in Ringer's-glucose (fig. 3). Accordingly, one might expect DNP to have much the same effect on lenses bathed in either medium. While the series of experiments reported in the preceding section was not repeated in full, it was found that DNP stimulated or depressed the respiration of

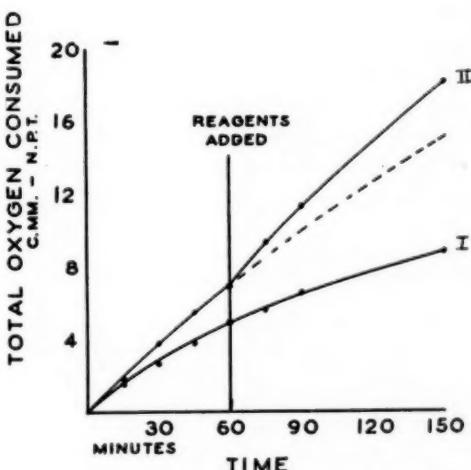


Fig. 7 (Field, Tainter, Martin, and Belding). Graph illustrating the effect of DNP on oxygen consumption of the ground rabbit lens. Curve I, control; Curve II, 0.25-mg. percent DNP added at 60 minutes. Oxygen consumed (cu. mm., N.P.T.) given directly, not based on unit weight. Broken line represents extrapolation of control period, Curve II. Ground lens suspended in Ringer's—0.2-percent glucose, pH 7.2, 30°C.

lenses in Ringer's-lactate as in Ringer's-glucose. This is shown in figure 8.

c. Comparison of Q_{O_2} and effect of DNP thereon of the rabbit lens, retina, and striated muscle (diaphragm). (1)

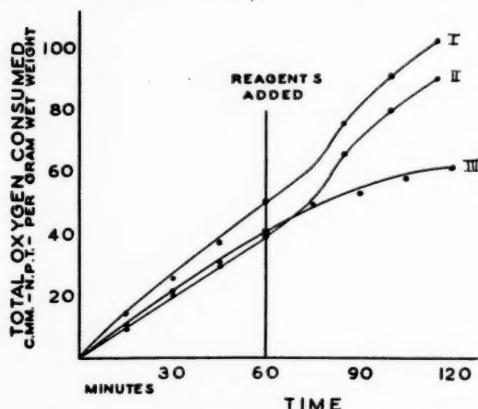


Fig. 8 (Field, Tainter, Martin, and Belding). Graph illustrating the effect of DNP on oxygen consumption of 3 rabbit lenses in Ringer's-0.2-percent lactate, pH 7.2, 30°C. DNP added at 60 minutes to give the following concentrations in mg.%: I, 0.1; II, 0.2; III, 400.0.

General comparison. Measurements of Q_{O_2} and studies on the effect of DNP on Q_{O_2} of the rabbit retina and striated muscle (diaphragm) were carried on concomitantly with the experiments just described. The experimental procedure and the special findings in these investigations will be reported subsequently. For our

present purposes it is sufficient to state that the work on retina and striated muscle was carried out on tissues suspended in Ringer's-glucose, pH 7.2, at 37° ± 0.01°C. Respiration was measured by the Warburg manometric method (Warburg, 1926). Sufficient data are presented in table 5 to enable one to compare for these three tissues—

- Rate of oxygen consumption (Q_{O_2}).
- Stimulating range of DNP concentration.
- Percentage stimulation evoked by DNP.

In assembling the data of table 5, as well as of tables 6 and 7, percentage stimulation and inhibition were calculated as described in section 2, a. The mean Q_{O_2} of retinal tissue and of striated muscle (diaphragm) was calculated from the first 30-minute readings (before addition of DNP). The shorter control period was used with these tissues because in their case the rate of oxygen consumption as a function of time decreased more rapidly than in the case of the lens.

It is shown in table 5 that the stimulating range of DNP concentrations is approximately the same for the lens and striated muscle. In the case of the retina this range is lower than for the other two tissues. The percentage stimulation

TABLE 5
COMPARISON OF Q_{O_2} OF LENS, RETINA, AND STRIATED MUSCLE (DIAPHRAGM) OF THE RABBIT
AND EFFECT OF DNP THEREON.

Tissue	Q_{O_2} (O_2 consumption; cu.mm. O_2 , N.P.T., per gm. wet wt. per hr.). Ringer's-glucose; pH 7.2					Stimulating Range of DNP Conc'n's in mg. %	Approximate Optimum Conc'n DNP, mg. %	Range of Percentage Stimulation by Optimum Conc'n
	No. of Expts.	Temp. °C.	Mean Q_{O_2}	Standard Deviation Q_{O_2}	Coef. of Variation Q_{O_2}			
Lens	44	30	32.1	7.4	23.1	0.05-1.25	0.25	14-110 average 57
Retina	73	37	1820*	214	11.8	0.01-0.40	0.10	27-87
Striated muscle	51	37	868*	150	17.3	0.05-2.50	0.50	100-380

* Q_{O_2} calculated from 30-minute readings.

TABLE 6

RABBIT 58. ALL RUNS IN RINGER'S-GLUCOSE, pH 7.2 AT $37^\circ \pm 0.01^\circ\text{C}$. COMPARISON OF \dot{Q}_{O_2} AND EFFECT OF DNP THEREON FOR 3 TISSUES FROM SAME ANIMAL

Lens	Control Period		Experimental Period					
	1st 30'	2d 30'	3d 30'	% Effect	4th 30'	% Effect	5th 30'	% Effect
Wt. 0.175 gm.			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
Conc'n DNP:mg. %								
0.25	60.8	56.0	76	+47	87	+83	73	+80

Retina	Control Period		Experimental Period					
	1st 30'	2d 30'	3d 30'	% Effect	4th 30'	% Effect	5th 30'	% Effect
Conc'n DNP:mg. %			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
0.00 (control)	1540	1450			1285			
0.05	1780	2150		+25	1515			0
0.25	1685	2330		+44	1140			-21

Striated Muscle (Diaphragm)	Control Period		Experimental Period					
	1st 30'	2d 30'	3d 30'	% Effect	4th 30'	% Effect	5th 30'	% Effect
Conc'n DNP:mg. %			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
0.00 (control)	995	800			767		800	
0.05	904	1191		+64	1132	+62	1112	+53

TABLE 7

RABBIT 59. ALL RUNS IN RINGER'S-GLUCOSE, pH 7.2 AT $37^\circ \pm 0.01^\circ\text{C}$. COMPARISON OF \dot{Q}_{O_2} AND EFFECTS OF DNP THEREON FOR 3 TISSUES FROM SAME ANIMAL

Lens	Control Period		Experimental Period					
	1st 30'	2d 30'	3d 30'	4th 30'	5th 30'			
Lens I. Wt. 0.177 gm.			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
Lens II. Wt. 0.180 gm.								
Conc'n DNP: mg. %			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
Lens I 5.00	60.5	50.8	48.2	+22	43	+38	19	-14
Lens II 10.00	54.0	52.8	50.2	-3	37	-26	39	-21

Retina	Control Period		Experimental Period					
	1st 30'	2d 30'	3d 30'	4th 30'	5th 30'			
Conc'n DNP: mg. %			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
0.50	1715	2415		+46	620			-68
5.00	2140	956		-54	64			-97
10.00	2270	680		-69	163			-94

Striated Muscle (Diaphragm)	Control Period		Experimental Period					
	1st 30'	2d 30'	3d 30'	4th 30'				
Conc'n DNP: mg. %			\dot{Q}_{O_2}		\dot{Q}_{O_2}		\dot{Q}_{O_2}	
0.25	886	1462		+105	1280	+87	1230	+73
0.50	760	2480		+300	1869	+219	1774	+190
5.00	730	2280		+277	989	+75	636	-8
10.00	966	1090		+40	521	-27	371	-52

evoked by "optimum concentrations" of DNP is of the same order of magnitude in the cases of the lens and retina, definitely greater in the case of striated muscle. The term "optimum concentration" is somewhat misleading because there is variation between the same tissues from different animals in this respect. It is best to consider the optimum concentrations given in table 5 as merely locating the optimum range. Had our animals been of genetically pure stock, such variations would probably have been reduced.

(2) Special comparison. In two cases simultaneous studies of the oxygen consumption of the lens, retina, and striated muscle (diaphragm) and the effect of DNP thereon were carried out using tissues from the same animals. While these experiments are necessarily restricted in scope, in that the range of DNP concentrations could not be great, they are interesting in that they afford direct comparison of Q_{O_2} and response to DNP of tissues from the same individual. The results are presented in tables 6 and 7.

It is shown in tables 6 and 7 that the respiratory rate of the lens is low in comparison with that of other tissues on a unit weight basis, since 27.4 and 35.7 times as much oxygen was used by the retinae and 15.6 and 14.6 times as much by striated muscle (per gm. wet weight per hour) in the two cases studied.

The diphasic response to low inhibitory concentrations of DNP described in Section 2, a, is well illustrated by the data of table 6 for the retina and of table 7 for all three tissues. The relative constancy of the percentage stimulation evoked by concentrations of DNP in the optimal range is shown in table 6 for the lens and in tables 6 and 7 for striated muscle. Such constancy was not found in the case of the retina in these experiments.

DISCUSSION

In the introduction to this paper two suggestions were made concerning possible effects of DNP on the respiration of the lens which might be interesting in connection with the etiology of DNP-cataract. We are now in a position to discuss these suggestions in the light of the findings just reported.

Proposition 1. The optimum concentration of DNP for stimulation of oxygen consumption of the lens might be well below that of other tissues. In such case the usual therapeutic dose, which would stimulate the respiration of the body as a whole, might inhibit that of the lens. Metabolic disturbances might ensue in consequence.

The evidence now available is sufficient to rule out this proposition in the case of the rabbit. The usual therapeutic dose was 3 mg. per kg. body weight or approximately 0.3 mg. percent if the drug were uniformly distributed throughout the body. Such a concentration would lie in the *stimulating range* both for the lens and striated muscle (diaphragm)—cf. tables 4 and 5—but might involve some degree of inhibition of retinal respiration. Whether these findings are applicable to man is, of course, impossible to say.

Proposition 2. The lens might be unusually responsive to DNP, so that the usual therapeutic dose of the drug would stimulate respiration to such an extent that the end-products of metabolism would accumulate more rapidly than they could be removed. Metabolic disturbances might then be expected.

It is shown in tables 5, 6, and 7 that the percentage increase in the oxygen consumption of the rabbit lens evoked by concentrations of DNP of the order of 0.3 mg. percent is about the same as in the case of the retina and definitely less than in the case of striated muscle (dia-

phragm). It is therefore evident that the rabbit lens is not unusually responsive to the action of DNP in so far as stimulation of oxygen consumption is concerned. Whether the increase in oxygen consumption actually evoked by concentrations of DNP ranging around 0.3 mg. percent is sufficient to involve an accumulation of end-products of metabolism we cannot say. It is conceivable that this is the case, in view of the relatively inadequate mechanisms for the supply and removal of substances important in the metabolism of the lens.

SUMMARY

1. The mean dry weight/wet weight ratio was found to be 0.307 for a series of 17 lenses from young rabbits.

2. The mean difference in wet weight between lenses from the same rabbit was 7.3 mg. in a group of 37 animals. The mean lens wet weight in this group was 215 mg.

3. The oxygen consumption of the excised rabbit lens, measured in Barcroft differential respirometers, was approximately the same in Ringer's, Ringer's—0.2-percent glucose, and Ringer's—0.2-percent lactate solutions, pH 7.2.

4. The mean oxygen consumption of the young rabbit lens in cubic millimeters (N.P.T.) per gram wet weight per hour (Q_{O_2}) was 32.1 at 30°C., and 47.4 at 37°C. These values were low in comparison with the mean Q_{O_2} 's of the rabbit retina and striated muscle (diaphragm)

at 37°C. which were 1,820 and 868, respectively.

5. The mean difference in Q_{O_2} between lenses from the same rabbit was 3.45 in a group of 19 animals. The mean Q_{O_2} in this series was 31.1.

6. The daily oxygen consumption of the average young rabbit lens, inferred from *in vitro* measurement at 37°C., was 0.00028 gm. (per lens).

7. A negative correlation of -0.805 ± 0.053 (Pearsonian coefficient) was found between Q_{O_2} and lens wet weight in a series of 44 cases.

8. The oxygen consumption of the nucleus of the rabbit lens was either nil or was too small to be measured by the methods used.

9. It was found that DNP stimulated or inhibited oxygen consumption of the excised rabbit lens, retina, and striated muscle (diaphragm) depending upon concentration. The stimulating range of DNP concentrations at pH 7.2 were 0.05 to 1.25 mg. percent for the lens, 0.01 to 0.40 mg. percent for the retina and 0.05 to 2.50 mg. percent for striated muscle.

10. The percentage stimulation evoked by optimum concentrations of DNP at pH 7.2 was 16 to 110 percent for the lens, 27 to 87 percent for the retina, and 100 to 380 percent for striated muscle (diaphragm).

11. The possible bearings of these findings on the etiology of DNP cataract were discussed.

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LUXATION OF LENS THROUGH A RETINAL TEAR INTO THE SUBRETINAL SPACE

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In the lifetime of every practicing physician many unusual and interesting pathological conditions are presented which relieve the monotony of the more common conditions seen. Because of the uniqueness of some of these conditions it is often worth while to record them briefly for the interest of others. The following case might bear publication, for after careful search no similar one was found to be recorded.

Mr. R. S., aged 36 years, presented himself at the University Hospital on January 13, 1937, with the following history: On November 5, 1936, some lime blew into his right eye while he was working in a beet-sugar factory. The eye immediately became inflamed and remained so for some days in spite of local treatment by his physician. As the inflammation subsided he discovered that he could see no better than to distinguish hand movements before his right eye. This condition remained to the time of his entering the hospital. His past history revealed the fact that he had congenital subluxation of both lenses. An attempt had been made to remove the left subluxated lens in November, 1910. This was followed by loss of vitreous and prolapse of the iris, so that no useful vision resulted. Six years later, this eye had been injured by a piece of steel, which necessitated enucleation. In December, 1910, a visual iridectomy, down and in, had been performed on the right eye without complication, and the patient was able to work and earn a living up to the time of his present illness.

Examination revealed a right vision of moving objects and a subnormal intraocular tension. The eye was quiet and showed no slitlamp evidence of a previ-

ous inflammation. A complete iridectomy had been performed, down and in, and the pupil was dilated and the iris tremulous. The vitreous contained innumerable fine dustlike opacities. The retina was completely detached and presented two

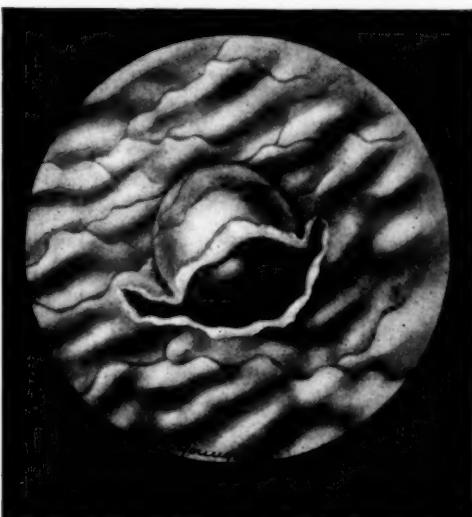


Fig. 1 (Fralick). Subluxated lens as seen through a large tear in the totally detached retina.

large retinal tears: one up and out, the other down and out. The upper tear was situated between the 10- and 12-o'clock meridians, two disc diameters from the limits of the ophthalmoscopic field, which was at the ora, and four disc diameters across the tear. The lower tear was between the 7- and 9-o'clock meridians, four disc diameters from the ora and four disc diameters across the tear horizontally. The margins of the lower tear were inverted, those of the margins of the upper retinal tear were everted. In the lower retinal tear was seen the periphery of the luxated lens, which elevated the detached

retina in front of it. The remainder of the lens was easily seen through the overlying retina (fig. 1).

Because of the completeness of the retinal detachment, the hypotony, and the size of the retinal tears, it was thought to be hopeless to attempt restoration of the patient's vision through any means whatsoever, but due to the fact that this was the patient's only eye, such an attempt was made. He was placed on an anterior Bradford frame, face down. The next day the lens appeared in the anterior chamber and was extracted through a limbal incision down and temporally, with the use of a large conjunctival flap and conjunctival sutures. The patient was first removed from the frame and rotated on his side, his face being kept pointed down and slightly to the right so that the lens would remain in the anterior chamber. A few beads of vitreous were lost in the loop extraction. The patient was then rolled on his back, face up. The postoperative course was uneventful. The large retinal tears could be easily seen by means of oblique illumination as well as with the ophthalmoscope. One month later an attempt was made at reattaching the retina

by diathermy operation, using Walker micropins. This operation was unsuccessful and the vision remained at moving objects.

COMMENT

This patient undoubtedly suffered from a total luxation of his previously congenitally luxated lens. Whether the lime burn was incidental or not to the detachment is difficult to state, but it seems only reasonable that the patient should receive total compensation for the loss of the eye. The retinal tear below with its inrolled posterior margin served as a funnel to receive the luxated lens when the patient was in the upright position. The lens could not be locked in the anterior chamber after its appearance there because of the previous complete iridectomy; thus it was necessary to perform the extraction while the patient was on his face. The presence of a total detachment of the retina, tremendous retinal tears, or hypotony, each alone would render the probability of cure by any method exceedingly doubtful, but when these conditions are found together the outlook for amelioration is hopeless.

408 First National Bank Building.

THE TESTING OF FITNESS FOR NIGHT FLYING: THE LIGHT SENSE*

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A light-sense tester correct in principle and convenient for use is an important instrument for testing night flyers. Important functions to be tested are (a) the ability to see at night and at low illumination, and the effect of dark adaptation on this ability, and (b) the amount and speed of dark adaptation. Normal or better-than-normal sensitivity in light adaptation is, of course, also important. The eyes that are needed for night flying are the best of what might be called the normal group; that is, of those that have good both dark and light vision. More important than speed and range of adaptation, however, is the place in the scale of sensitivity at which the change occurs.

(a) *The ability to see at night and at low illumination, and the effect of dark adaptation on this ability.* In general, the ability to see at low illumination may be tested by determining the threshold of light sensation, or what is often called the light minimum. Also, the light minimum may be determined at the end of any period of light adaptation from low to high, in which case the result may be taken as indicating the state of sensitivity of the retina under that condition.† Correspondingly, the effect of dark adaptation on the ability to see at low illumination may be tested by determining the threshold of light sensation, or the light minimum, at the intervals selected for consideration from the beginning of dark adaptation until the process is complete.

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† If desired, the determination of the light difference may be substituted here for the determination of the light minimum. For some purposes this substitution is preferable.

The results of these latter determinations when plotted against time in the form of a curve give a complete picture of the course of adaptation of the eye in question throughout a period of time. Thus one can obtain the eye's sensitivity at any time from the beginning to the end of dark adaptation. Whether one or a number of these intervals is chosen for test depends upon the purpose for which the test is being made. If the eye's maximum sensitivity is wanted approximately, for example, the test should be made at the end of an interval of 20 or 30 minutes.

In order to show the amount of individual variation that may be found in the ability to sense light at different intervals in the course of adaptation, a study was made of 206 cases, in which the range of age was from nine to 70 years.‡ The results of this study are given in figure 1. In A of this figure are shown the results for the entire group, and in B and C for the cases separated into two groups—those below and those above 35 years of age.

(b) *The amount and speed of dark adaptation.* In connection with the process of dark adaptation, two important points are presented for testing: (1) the total amount or range of adaptation for the eye in question, and (2) its speed of adaptation; that is, the quickness with which the eye changes its sensitivity with change from light to dark and conversely from dark to light. Those conversant with the ocular needs of the night flyer say that

‡ For the details of this study see Ferree, C. E., Rand, G., and Stoll, M. R. Critical values for the light minimum and for the amount and rapidity of dark adaptation. Brit. Jour. Ophth., 1934, v. 18, pp. 673-687.

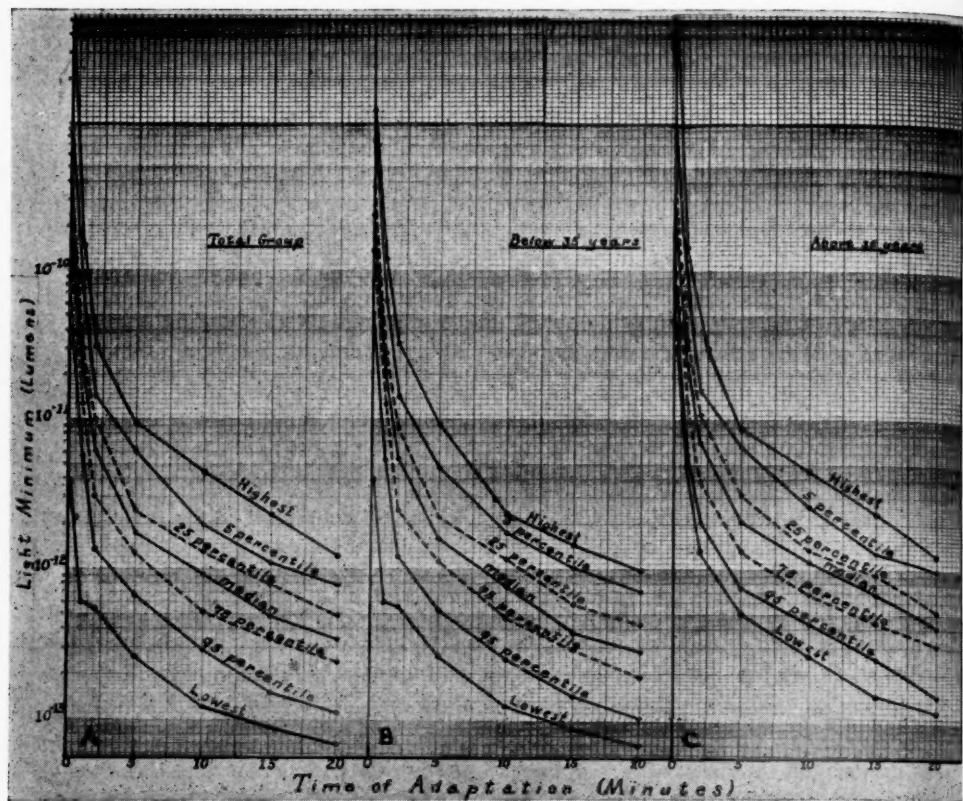


Fig. 1 (Ferree and Rand). The light minimum for 206 nonpathologic observers, aged 9-70 years, at the end of the period of light adaptation and after 1, 2, 5, 10, 15, and 20 minutes of dark adaptation for the highest, the lowest, and the 5-, 25-, 50-, 75-, and 95-percentile cases: A, for the total group, B, for the group below 35 years, and C, for the group above 35 years of age. The light minimum is expressed in lumens entering the eye per sq. mm. of stimulus. The distance between the limiting curves represents the total range of values for the group in question; that between the 5- and 95-percentile curves, the middle 90-percent range of values; and that between the 25- and 75-percentile curves, the middle 50-percent range of values.

the latter of these two points is the more important. In modern aviation, they maintain, what the night flyer needs more than anything else is the power to change his vision quickly from the illuminated cockpit and instrument panel to the outside world and back again. In this connection it may be noted that the transition from outside back to the cockpit does not present a serious problem because, as will be discussed later in the paper, light adaptation takes place with much greater rapidity than dark adaptation. What problem there is comes from the fact that until

sufficient light adaptation has taken place a disturbing dazzle may be present. In most cases, at medium intensities this effect will disappear in a few seconds. If found necessary a test for this can easily be devised. However, in relation to fitness for night flying it is perhaps well to point out again that neither speed nor amount of change in sensitivity is so important as place in the scale of sensitivity in which they occur. That is, it is quite possible that a candidate might have a good range and speed of adaptation and still a comparatively poor power to see at low illumina-

tion both at the beginning and at the end of the period of dark adaptation. Such a person would be obviously unfit for night flying. To be fit for night flying the candidate must have a normal or better-than-normal rating in power to see at low illumination at the beginning of the period of dark adaptation and throughout its entire course from beginning to end.

For testing the amount or range of adaptation the threshold or light minimum can be determined at the beginning of dark adaptation and at the end of some interval of suitable length, preferably 20 or 30 minutes. A good conception of the amount of adaptation that may be expected in any group of nonpathologic observers may be obtained by inspecting the curves of figure 1; also a fairly good conception of the range of individual variation in this amount, although these curves were not plotted specifically to bring out this point.

For testing the speed of adaptation one of the following methods may be used. In the first two of these, alternate procedures are given for measuring the speed of adaptation in general, regardless of the purpose for which the measurements are to be used. The second two are presented as quick tests for the acceptance or rejection of candidates on the basis of predetermined critical values and for the rating of those who fall above or below these values. *Method A.* The light minimum can be determined at the beginning of a period of dark adaptation and again at the end of some interval sufficiently long to cover the greater portion of the period of changing sensitivity, for example, at the end of 5 minutes. Either the total change of sensitivity that has taken place in this time or the average rate of change, that is, the total change divided by the time, can be taken as the index of speed of adaptation. In this method the time of adaptation is fixed and the intensity of light required

for the discrimination is determined.

Method B. The light minimum can be determined at the beginning of the period of dark adaptation and then the time required to discriminate a predetermined intensity of light in the test field. Again the change of sensitivity divided by the time required to obtain this change may be taken as the index of speed of adaptation. In this method the intensity of light to be discriminated is fixed and the time required to attain the sensitivity needed for this discrimination is determined.

Method C. In case a critical value has been determined in preliminary work for the length of time required to sense a given intensity of light in the test field, the attempt to discriminate the test field may be made at the end of that interval. If the discrimination can not be made, the candidate is ruled out. If, however, a rating of candidates who have failed is wished, the intensity of light in the test field can be increased until it is sensed. Likewise, if a rating is wanted of candidates whose speed of adaptation is greater than that indicated by the critical value, the intensity of light can be increased until it is just sensed. In this method both the time and intensity of light in the test field are set at predetermined values and the determinations made whether the candidate can meet the requirement. *Method D.*

The intensity of light in the test field may be set at a predetermined value and the time required to sense this intensity measured directly. This time may then be compared with a predetermined critical time. Or the alternative procedure may be used; that is, the time of adaptation may be set at a predetermined value and the light minimum determined at the end of that time. The result may then be compared with a predetermined critical value of light minimum. From these results, the candidate may be rated merely as meeting the requirement, more than meeting

the requirement, or failing to meet the requirement; or, if desired, the rating can be made quantitative.

Methods C and D can be used only on the assumption that all the candidates tested have good light sensitivity while still light-adapted, that is, at the begin-

at the beginning as well as at the end of the period of dark adaptation selected. Methods C and D have been considered here only because they are of the type that has been suggested by others and used during the World War.

With respect to the four methods de-

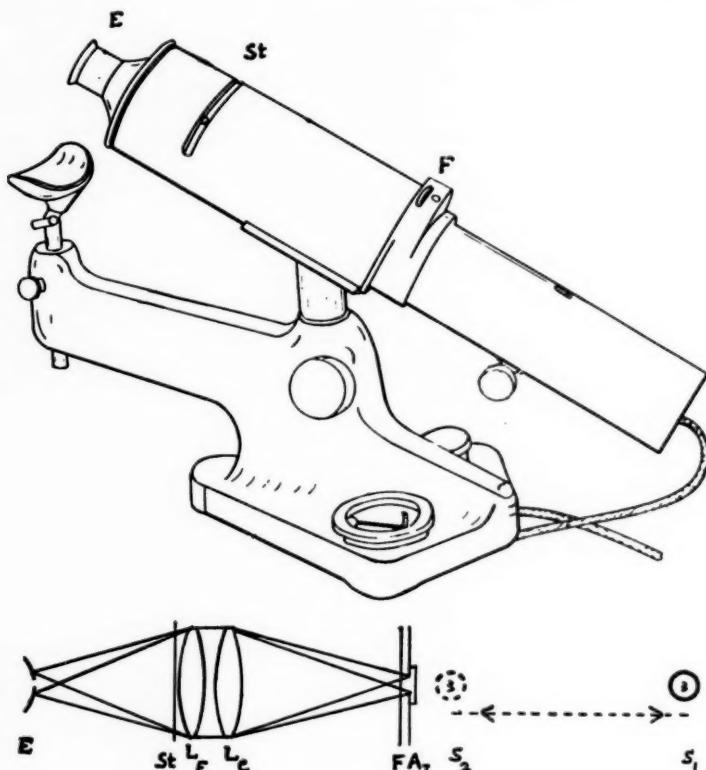


Fig. 2 (Ferree and Rand). A simplified instrument for testing the light sense and a diagram of its optical system. S_1 = source of light in far position; S_2 = source of light in near position; A_1 = intake aperture with diffuser; F = battery of filters; L_c = collimating lens; L_F = focusing lens; St = plate containing stimulus aperture; E = eyepiece.

ning of the period of dark adaptation. The night flyer should have normal or better-than-normal ability to see objects the instant he looks from the cockpit to the outside world as well as normal or better-than-normal power to increase this ability as dark adaptation is prolonged. Obviously the point should be tested, not assumed; that is, the test should be made

lineated, it may be noted that where the time is fixed and the light minimum determined, due precautions for the control of fixation of the observer can be taken, as will be seen in the discussion of control of fixation given later, and accurate determinations can be made. On the other hand, where the intensity in the test field is fixed and the time required to attain

the sensitivity needed to see this intensity is determined, the observer's fixation is uncontrolled and the test field may be sensed in either the central or the more sensitive peripheral retina, which fact introduces a considerable element of variability.

There is a further very serious objection to the use of this method for more than a very short period of time of adaptation. To require the observer to attempt to hold a state of fixation of the eye for any considerable length of time induces an ocular condition that is very detrimental to the purpose of the test, and unless the observation is continuous an exact measurement of the time can not be made. Anyone who has ever read a photometer knows that a few seconds of staring at the test field will obliterate quite a little difference in brightness in the surfaces compared. In other words, a fixed eye quickly loses its sensitivity to brightness difference. A single ocular movement or blink will restore the sensitivity lost by several seconds of fixed exposure. It is almost impossible to standardize the ocular movement and blinking that will occur in three to five minutes. In short, the candidate who takes his task most seriously and gives the steadiest fixation will recover his sensitivity most slowly. In fact, if it were possible to rule out blinking and ocular movement he would lose power to discriminate brightness difference rather than recover that power. It does not take long, particularly under low illumination, to stare out smaller differences in brightness in the test field and the details formed by these differences.

Still further, a fixed or as nearly as possible motionless eye in the dark room soon passes into a very abnormal condition of inability to make objective discriminations, due, in part, to the masking influence of a great variety of subjective

visual phenomena. Ocular movement operates very strongly to prevent these veiling phenomena, a single such movement often bringing out in strong relief brightness differences and details that have been completely obscured. A fixed eye is never a sensitive eye, and the best way to obtain high sensitivity and at the same time to standardize sensitivity is, perhaps, to make a quick ocular movement before each observation. In general, therefore, all experimental methods or test conditions requiring unduly long periods of fixation of the eye should as far as possible be avoided.

The Ferree-Rand instrument for testing the light sense may be recommended as very convenient and effective for making these determinations. It was devised for the control of all the factors that influence the results of the test for sensitivity to light and for making a specification by direct measurement of the amount of light entering the eye in any determination. The instrument has been described in a previous paper.* In figure 2 drawings are given of a later simplified model of this instrument and its optical system.

The instrument has the following features and advantages:

1. It is easily portable, quick and convenient to operate, and gives a high reproducibility of result.
2. The amount of light entering the pupil of the eye, the density of light in the test field, and the brightness of the test field can be measured directly, and the instrument calibrated in terms of any or all of these measurements.
3. The results are independent of changes in the size of the pupil, including the changes produced by the use of pilocarpine and other miotics.
4. The results seem also to be inde-

* Ferree and Rand. A new type of instrument for testing the light and color sense. Amer. Jour. Ophth., 1931, v. 14, p. 325-333.

pendent of the condition of refraction of the eye in so far as this affects the formation of the image.[†] This permits a more direct examination of the powers of the retina than is ordinarily the case and adds greatly to the ease and convenience of making the examination. It also decreases the range of scatter of results in a group of observers—a very important feature in the use of the instrument in all types of classification, including diagnosis.

5. Because of the small aperture in the eyepiece the results are further rendered independent of the influence of accommodation and distance of projection of the image. Distance of projection of the image has a small but appreciable effect on the determination of retinal sensitivity.

6. The size of the test field may be varied through a visual angle ranging from 0 to 36 degrees. These changes may be quickly and conveniently made. The test field may also be made to have any shape that is desired. As an objective check on the judgment, the test field may be given a suitable shape and rotated into any position within 180 degrees.

7. Provision is made so that the broken circle may be used as test object, in which case not only is an objective check obtained on the correctness of the judgment but an additional and very effective control of fixation is secured. It also can be used under conditions which test acuity at low illumination or, in fact, at any level of illumination desired, with the eye practically independent of errors of refraction in so far as these affect the formation of the image. The ability to render the eye independent of conditions of re-

fraction is a very important feature in testing the retina's power to sense light and to discriminate detail. With this instrument both the light and the space sense can be tested under conditions which apparently render the test independent of the resolving power of the refractive system of the eye.

8. A wide range of intensity of light is provided under quick and convenient control. The change of intensity is produced without change in the composition of the light.

9. To insure constancy of the efficiency of the lamp, a checking standard is furnished, so that at any time the illumination of the test field for a given reading of the scale can be compared with that given by a standard lamp, and a corrective change made in the operating current, if needed.

10. The instrument can be used with equal facility in any state of adaptation, light or dark.

11. All scales can be read by the examiner in the dark, and all adjustments of the instrument can be made without interfering with the state of adaptation of the observer.

12. For the determination of the amount and rate of adaptation, a preexposure field variable in size is provided, surrounding and including the test field.

13. Either the light minimum or the light difference can be determined. The instrument was designed primarily for determining the light minimum. A very convenient and effective attachment, however, has been provided for the precise determination of the light difference through a wide range of intensities.

14. By the insertion of appropriate filters the instrument can be used just as effectively for testing the color sense and the achromatic sensitivity to colored lights as for testing the light sense.

15. The instrument can also be used

[†]In a compilation of norms a small characteristic difference in the results was found for hyperopic eyes. Inasmuch as a difference was not obtained for myopic and astigmatic eyes, the explanation can probably be found in the condition of the sensorium, not in the image. The hyperopic eye is usually regarded as poorly developed.

very effectively for the detection of small central scotomas for either light or color—scotomas of such a size as to be difficult of detection with the perimeter or tangent screen yet of sufficient importance to reduce acuity and retinal sensitivity.

The instrument makes it possible to do the work of determining the light minimum and curve of dark adaptation under the precise conditions of measurement and control that are needed in making standard determinations. Some of these are: (1) All variable effects due to size of pupil, accommodation, distance of projection of the image and errors of refraction are, as far as is possible, eliminated from the results. (2) The eye can be presensitized to a constant state of light adaptation before each series of determinations is begun. (3) Determinations of the light minimum can be made with a constant state of light adaptation and after fixed intervals of dark adaptation. (4) Fixation can be maintained in all cases with a very satisfactory degree of accuracy. (5) The density of light or the amount entering the eye per unit area of stimulus can be measured directly and expressed in terms of lumens per square millimeter of stimulus. These values may be read directly or readily derived from the scales of the instrument. (6) A means of making an objective check on the judgment is provided.

After considerable preliminary experimentation on the effect of size and shape of stimulus on the results, an oblong stimulus subtending a visual angle of 10 degrees in the horizontal dimension and 3 degrees in the vertical was chosen as the most suitable for making standard determinations. As an objective check on the judgment this stimulus can be rotated when desired into any position within 180 degrees.

As an aid to the control of fixation, the test should always be begun at an inten-

sity at which the stimulus is visible and the observer instructed to look at its center. The light should then be rapidly decreased until it is reported as no longer seen and then again increased to the threshold of visibility. Little or no difficulty will be experienced in the control of fixation for a stimulus of this size, as its edges extend into the more sensitive peripheral retina and there is in consequence no incentive for the eye to take an eccentric fixation; that is, the stimulus will be most clearly seen when its center is fixated. It can be readily understood that the use of any luminous device within the stimulus area for the control of fixation, however low the luminosity, would not be desirable because of the effect it would have on the value of the light minimum. It can be further understood that circumscribed devices, such as we have described in a former paper,* would not be effective with the size and shape of stimulus we have found it best to use in making these determinations; and that the blind-spot control that we also described in this and other papers is entirely infeasible for any type of routine testing. With the size of stimulus and the method recommended for making the determinations, a very satisfactory reproducibility of result may be obtained, for any given observer and a sufficiently narrow range of scatter in a group of observers. This is commonly accepted as the final and practical check on adequacy of control.

In order that each series of determinations should be begun with the eye in as nearly the same state of sensitivity as possible, the observer should be adapted to a given intensity of light for a suitable length of time before the test is begun. The selection of the conditions for stand-

* Ferree, Rand, and Stoll. Size of stimulus in relation to the eye's sensitivity to light and to the amount and rate of dark adaptation. *Jour. Exper. Psychol.*, 1934, v. 17, pp. 646-661.

ardizing this preliminary light adaptation will depend on the purpose for which the tests are to be used and the form of the test. This point will be given further discussion below.

The test is begun by requiring the observer to look for three minutes into the illuminated preëxposure field of the instrument. This field is circular in shape and subtends an angle of 36 degrees at the eye. The density of light in the field is 17×10^{-8} lumens per sq. mm. This intensity is, for example, approximately 550 times the average value of the light minimum for the group of observers whose results are given in figure 1 at the beginning of the period of dark adaptation, and 447,000 times that value after 20 minutes of dark adaptation. Following the period of preëxposure the plate containing the stimulus aperture is dropped into position and the light reduced to threshold intensity as quickly as possible by the interposition of a neutral filter of the proper density and the rapid adjustment of the distance of the lamp of the instrument until the observer reports the disappearance of the stimulus. The light is then quickly increased until the stimulus reappears and the point of reappearance is taken as the light minimum.

The light minimum is determined in this way at the intervals selected for test during the course of dark adaptation. There will of course be some slight variation in the time consumed in arriving at the final determination, but, in general, this time should be no longer than three seconds. As might be expected, the data obtained during the first few minutes of dark adaptation will be found to be somewhat more variable than those obtained later in the adaptation process, owing to the fact that the exact time at which the determination is completed exerts a greater influence on the results obtained at the beginning of the period when the rate of

change of sensitivity is at its maximum. In conducting the test care should be taken to reduce this variability to a minimum. The type of test instrument used is of great aid in this respect.

As stated above, an important point in the method of making the determination is the standardization of the preliminary light adaptation. This standardization consists in the choice of the intensity of light and the time the eye is to be preëxposed to that intensity before any of the determinations of the sensitivity of the eye in the dark are made. In doing this, the tendency, in general, is to choose a longer time of preëxposure than is needed to standardize the sensitivity of the eye. This tendency is due to the fact that the choice is usually based on a knowledge of dark adaptation alone. In a later paper the results of a study of light adaptation will be published including curves for a comparison of dark and light adaptation. These results show (a) that in general light adaptation takes place much faster than dark adaptation; (b) that light adaptation takes place very rapidly for the first few minutes and then very slowly, soon becoming negligible unless very long periods of adaptation are compared; and (c) that the sensitivity that was gained in 25 minutes of dark adaptation after three minutes of exposure to the preëxposure field of the instrument, was lost in three minutes of subsequent exposure to this same field and that the further loss of sensitivity by exposure to this field was comparatively little, becoming negligible after five to 10 minutes. The very rapid loss of sensitivity at the beginning of light adaptation is shown by the fact that in the first 15 seconds, the interval represented by the nearly vertical section of the curve for light adaptation, the light minimum was increased more than 100,000 percent. For the first five minutes, the interval representing the section extending just

beyond the knee of this curve, the increase was 227,173 percent; for the second five minutes it was 34 percent; for the third five minutes, 4 percent; for the fourth five minutes, 5 percent; and for the last five minutes, 1 percent.

We can perhaps best discuss this question of preadaptation or preexposure by giving some of our own experience. When we devised the light-sense tester our thought was to provide in the instrument a preexposure field the intensity of which could be controlled and made constant for all times and all places. Whether this could be considered to give sufficient light adaptation, we did not at that time know. We began our work with the instrument by allowing 20 minutes of preadaptation in a room with white walls and ceiling, illuminated to a given intensity with well-diffused light, the observer reading from a page the intensity of which was also measured and kept constant. The observer was then taken into the dark room and located in position at the instrument as quickly as possible. Further to standardize the sensitivity of the eye three minutes of exposure was then given to the preexposure field of the instrument before the test was begun. These conditions were found to give a wide range of dark adaptation and a high reproducibility of result with all our subjects except those who had been confined for some days in a darkened room. For these a longer period in the light room was needed. In later work we found that unless the observer had been confined for some time in a darkened room, the use of the 3-minute preexposure period alone gave no difference in the adaptation curve with the possible exception of the initial determination of the light minimum and the value obtained at the end of the first minute of dark adaptation. For tests, therefore, in which the results for the first minute of dark adaptation are not important, and

perhaps for all tests, a preexposure of three to five minutes to the illuminated field of the instrument should be sufficient unless the observer had previously experienced some unusual situation with respect to adaptation; namely, had been exposed for a considerable length of time to a very high intensity of light, such as might be the case were he brought in directly from the flying field, or had undergone a considerable period of dark adaptation. In any event it should not be difficult for the individual examiner to determine for himself whether or not it is adequate in any situation that may arise. In determining this point, reproducibility of result is, of course, a very important consideration.

As we have already said, light adaptation takes place very rapidly for a short time and then very slowly, becoming negligible unless very long periods of adaptation are involved or taken into account; as, for example, when the test performance itself involves a long period of opportunity for light adaptation, that is, a long period of exposure to light of a given intensity.

The curves in figure 1 give a representative showing of the type of work that may be done with the instrument by the method described above and, as already noted, of the individual variations that may be expected with reference to light sense and dark adaptation in a group of nonpathologic observers. It will be understood that these curves do not sustain a direct relationship to the title of the paper in the sense that they were not obtained by testing either aviators or candidates for aviation, and their significance has not been proved by comparison with service records, and so forth. They are included in an auxiliary relationship to show what might be expected, particularly with regard to individual variation, in a group of nonpathologic eyes fairly well

distributed with respect to age.

For these curves, the light minimum was determined at the end of the 3-minute preëxposure period and at selected intervals until little or no change in sensitivity could be detected. The intervals used were 1, 2, 5, 10, 15, and 20 minutes. The determinations were made for 206 eyes, 114 of males and 92 of females. In every case the refractive condition of the eye was carefully determined and an ophthalmoscopic examination made. No cases showing a pathologic condition, however slight, were included in the group. The range of age in these cases was from 9 to 70 years. Ten fell in the group 5 to 15 years, 40 in the group 15 to 25 years, 64 in the group 25 to 35 years, 47 in the group 35 to 45 years, 36 in the group 45 to 55 years, 5 in the group 55 to 65 years and 4 in the group 65 to 75 years. It was very difficult to find observers over 55 years of age who could be classed as completely normal by the ophthalmoscopic examination. Subjects, for example, having arteriosclerosis, slight lenticular opacities, and cloudiness of the media were not accepted.

In figure 1 A are given the adaptation curves derived from the highest, the lowest, and the 50-percentile or median value at each period tested for the total group of observers; also from the 25-percentile or first quartile value, the 75-percentile or third quartile value, the 95-percentile, and the 5-percentile values. In figure 1 B, curves for these values are given for the group below 35 years of age, and in figure 1 C, for the group above 35 years. The distance between the limiting curves represents the total range of values for the group in question; that between the 5- and 95-percentile curves the middle 90-percent range of values; and that between the 25- and 75-percentile curves, the middle 50-percent range of values. The light minimum expressed in lumens entering the eye is plotted along the vertical coordinate

and time of adaptation along the horizontal coordinate.

An examination of the data shows: (1) The total range of light minimum at the end of 5, 10, 15, and 20 minutes of dark adaptation averages for the entire group, 2,816 percent; for the middle 90 percent of the group, 659 percent; and for the middle 50 percent of the group, 119 percent. (2) The gain in sensitivity as an effect of dark adaptation for the first two minutes is on the average 4,429 percent; for the first five minutes, 13,893 percent; for the second five minutes, 124 percent; for the third five minutes, 75 percent; and for the fourth five minutes, 50 percent. (3) The average value of the light minimum before adaptation is 824 times that of the light minimum after 20 minutes of dark adaptation; that is, on the average, the sensitivity of the eye after 20 minutes of dark adaptation is 824 times as great as when adapted to light of the intensity used for the presensitization period in this study.

These curves show also that age above 35 years exerts an important effect on the power of the eye to adjust itself for seeing at low illumination. From this it would seem that the testing of the light sense renders an additional service in helping to establish the case against age as a disqualifying factor for night flying and of presenting evidence against those who wish to continue in this capacity beyond their time of fitness. For example, the light minimum for the median curve for the 5-, 10-, 15-, and 20-minute intervals averages 52 percent higher for the group above 35 than for the group below 35 years of age; for the 25-percentile curve, 33 percent higher; for the 75-percentile curve, 45 percent higher; for the 5-percentile curve, 38 percent higher; and for the 95-percentile curve, 57 percent higher.

If a more specific recommendation were

wanted for a routine test of fitness for night flying, the following might be suggested. After a suitable period of adaptation, perhaps three to five minutes, to the preexposure field of the instrument, the light minimum should be determined and then redetermined after 2, 3, or 5 minutes of dark adaptation, as may be desired. From the results obtained, the sensitivity of the light-adapted eye may be derived, the rate of gain in sensitivity for a given period of dark adaptation, and the sensitivity at the end of this period. This would seem to give the most important information needed; namely, the light sensitivity of the light-adapted eye, the sensitivity that may be obtained after a selected period of dark adaptation, and the speed of dark adaptation. This information would enable the examiner to exclude eyes defective in power to see at low illumination when either light adapted (nyctalopic) or dark adapted (hemeralopic) and to select the best of the normal eyes.

For deciding which is the best of any set or number of test methods under consideration, either of the following two procedures may be used: (a) Two groups of aviators may be selected for examination, one whose success in night flying has been proved and the other whose unfitness has been demonstrated. The test which shows the widest difference in result between the two groups should be considered as the most sensitive and significant. (b) All the entering candidates who have passed the other tests of ocular fitness for aviation may be tested and the results of the tests compared with their subsequent success in night flying.

Critical values to serve as a standard of reference for the selection and rejection of candidates for night flying may also be obtained from the results of either of these two procedures. In the first, separate distribution curves may be plotted

for the test data obtained from the successful and the unsuccessful night flyers, and from the overlapping area of these curves results may be chosen which shall be accepted as borderline or critical. In the second, a distribution curve may be plotted for the test data obtained from all the entering candidates who, as noted above, have passed the other tests of ocular fitness for aviation; and on the basis of this curve a certain percentage of candidates may be selected as best qualified for night flying. The selection thus made may be improved by checking against subsequent records in night flying and the critical values revised accordingly.

In conclusion we may say that our instrument was devised because there was not to our knowledge any instrument that satisfied even the more elementary requirements for testing the light sense. In designing it, our intention was to include as far as was possible all of the features that are needed or desired in a light-sense tester. It has now been in continuous use for more than six years and we can truthfully say that in our opinion and experience it is entirely satisfactory. We give it our unqualified endorsement.

SUMMARY

In determining fitness for night flying, important functions to be tested are (a) the ability to see at night and at low illumination and the effect of dark adaptation on this ability and (b) the amount and speed of dark adaptation. Of these latter functions, speed of adaptation seems to be more important than amount. The night flyer needs especially the power to change his vision quickly from the illuminated cockpit and instrument panel to the outside world and back again. Normal or better-than-normal sensitivity in light adaptation is, of course, also important. The eyes that are needed for night flying are the best of what might be called the

normal group; that is, of those that have both good dark and good light vision. More important than speed and range of adaptation, however, is the place in the scale of sensitivity in which the change occurs. That is, it is quite possible that a candidate might have a good range and speed of adaptation and still a poor power to see at low illumination both at the beginning and at the end of the period of dark adaptation. Such a person would be obviously unfit for night flying. To be fit for night flying the candidate must have a normal or better-than-normal rating in power to see at low illumination at the beginning of the period of dark adapta-

tion and throughout its entire course from beginning to end.

Tests are described for the light minimum under light and dark adaptation and for determining the amount and speed of adaptation. A special test of fitness for night flying is also recommended which is sufficiently quick and convenient for use in routine testing and a procedure is discussed for proving the significance of the test and for determining the critical values to be used in accepting and rejecting candidates for night flying. A suitable instrument is recommended and its advantages for making the test are briefly discussed.

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THE TREATMENT OF SEBORRHEIC BLEPHAROCONJUNCTIVITIS*

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Seborrhea is an old subject, and many dermatologists number it among their most perplexing problems. Seborrhea of the lid margins is certainly not one of the least that presents itself to the eye physician. It probably causes more chronically inflamed eyelids and conjunctivae than any other one agent, and, though never serious, it is continually annoying and disfiguring. The term seborrhea literally means hyperactivity of the sebaceous glands and has been too seldom used in relationship to disease of the eye and the adnexa. This is, no doubt, owing to the fact that it is so commonplace, and being at the borderline between dermatology and ophthalmology, few have taken the time to describe it or to discuss its treatment. Clinical observations lead me to believe that it begins in the sebaceous or

Zeiss glands of the cilia and in the meibomian glands, which are the enormously enlarged sebaceous glands imbedded in the tarsal plates. The excessive secretion accumulates in these glands, causing their dilatation, and they act as a pool of excellent culture media in which the ever-present pus-forming bacteria may grow. Fortunately, these bacteria are of low virulence, with a few exceptions, and their toxins produce a low-grade inflammation that causes a desquamation of the skin of the lid margin, the death of the cilia, and a pouring out of the excessive and mildly irritating secretion from the meibomian glands into the conjunctival sac.

This is a disease of adolescent and adult life and should not be confused with blepharitis marginalis, frequently seen in children who live under a poor hygienic routine. It is true that the late ulcerative stage does present a very similar picture to blepharitis marginalis, and it is here that most of the mistakes in diagnosis are made; for it is not until the patient has

* From the Department of Ophthalmology, Tulane University Graduate School of Medicine. Read before the Southeastern Sectional Meeting of the American College of Surgeons, at Atlanta, Georgia, February 2-5, 1937.

been treated by the usual methods for a long time without improvement that one realizes that he is dealing with this more stubborn disease.

SYMPOTMS

The first complaint is almost always that of an itching or burning sensation in the eyes, aggravated by use, smoke, dust, and other mild forms of irritation, and frequently accompanied by the sensation of a foreign body in the eye. The red lid margin with the exfoliating skin or dandruff among the cilia is not an early symptom, but this is frequently the symptom that drives the patient to the eye physician after he has spent considerable time and money in seeking relief at the hands of the refracting optician. Occasionally styes and infected chalazia are symptoms that come after the process is well established. If the condition is further neglected, the lid margins become thick, ulcerated, and incrusted. The conjunctiva becomes chronically inflamed, and mucous shreds collect in the conjunctival sac and continually irritate the eyes. The cilia fall out, sometimes until the lid is as bald as the patient's scalp. It is well to note that this condition is almost always associated with seborrheic dermatitis of some other part of the body, usually of the scalp, which is characterized by dandruff or alopecia or both, also behind the ears or in the eyebrows. Some dermatologists believe that the eyelids become infected from the scalp and eyebrows, and this may be correct, for frequently permanent improvement is not to be had until the associated seborrhea is well under control.

TREATMENT

The treatment of this condition is both local and general. *Local treatment* consists of: 1. Epilating the infected cilia. These may be easily identified by observing the lid margins under good illumination with

an ordinary Beebe or Berger loup. The base of an infected cilium looks dark and appears to be about twice the normal diameter. When epilated, the roots are encased in a cylindrical mass of necrotic material or pus. If these infected cilia are not removed, they act as a source of continued irritation until the hair follicle becomes so necrotic that the cilium falls out, or a small pustule forms around its base.

2. The expression of the contents of the meibomian glands. This has proved to be one of the most important factors in the treatment of the condition. It is easily accomplished by first anesthetizing the conjunctiva with a drop of 0.5-percent pontocaine. Then using a spatula made for the purpose the contents of the glands are expressed; but I have found the use of the spatula more painful than the pressing of the two lid margins one against the other. This is accomplished by having the patient close his eyes gently, and as the patient looks up with the eyes closed, gentle pressure with the forefinger of the left hand is exerted inward about 3 mm. below the lower lid margin, just enough to evert the lid slightly. The patient is asked to look down, and pressure with the thumb of the right hand against the margin of the upper lid, after the same manner, brings the two lid margins, one firmly against the other. Then, exerting pressure gently and at the same time pulling the lids out from the eyeball, in order not to put undue pressure upon the globe, the contents of the meibomian glands are easily expressed. To those who have never tried this, it is surprising to find not only how much secretion these little glands can hold, but that many of them that look normal on inspection are filled with creamy pus. This procedure is repeated until all the glands of both lids have been evacuated. Occasionally, it is necessary to use a small, sharp discussion knife to open the closed ducts of some of

the glands; and sometimes it requires repeated attempts before some of the glands can be emptied. Following this procedure, it is well to irrigate the conjunctival sac with some mild solution, for it is filled with the material expressed from the glands.

3. Rubbing of the lid margins. A pledget of cotton is saturated with a mild antiseptic solution; such as, hexylresorcinol, merthiolate or metaphen solution—peroxide in half strength is efficacious, but has a definite tendency to change black eyelashes to blonde, which is objectionable to many patients. The gently closed lids are rubbed briskly with the saturated pledgets along the base of the lashes for one to two minutes. This softens and removes dandruff or crusts. Immediately following this, a 1-percent resorcin or Eurosol ointment, which is put up in a petrolatum base, is applied by placing a small amount on the same pledget of cotton and rubbing it into the base of the lashes in the same manner that the antiseptic solution was applied. The patient is carefully instructed how to carry out this procedure at home, for it has to be repeated daily.

If the process has progressed to the ulcerative stage before the lids can be rubbed, the remaining infected cilia and the crusts that form over the ulcers should be removed, and some mild antiseptic applied. Healing is usually prompt, and after a few days the rubbing can begin. Occasionally, the puncta become closed by the scarring from the ulcerations and have to be opened and probed in order to reestablish proper drainage of the tears.

4. Adrenalin-chloride solution. A prescription that contains 25 minums of 1 to 1,000 adrenalin chloride to an ounce of 2-percent boric-acid solution is given for use once or twice daily. This serves to reduce the congestion in the conjunctival

sac, and if there is an allergic background it may help relieve that.

5. X-ray therapy. Greenbaum,* before the meeting of the American College of Physicians, in 1933, recommended the weekly exposure of the lids to small doses of the roentgen ray. I have not yet had a case that required X-ray treatment; therefore, I should reserve it for the intractable conditions. However, I strongly urge you not to have your patient's lids treated by the X ray unless the eyeball is properly screened from the rays; at least, not until it is more definitely determined what effect radiation has upon the lens and other structures within the eye.

The general treatment consists of: 1. A careful refraction, and the prescribing of the proper glasses when indicated. Particular attention should be given to errors of astigmatism and to cases of heterophoria. Refraction should always be done under homatropine cycloplegia up to and sometimes above the age of 50, unless it is contraindicated.

2. A careful medical history should be taken, and if indicated, a physical examination should be made, with special reference to foci of infection, anemia, and low basal-metabolism rates. Corrective procedures should be started as soon as possible.

3. Vitamin concentrates are of definite value, especially those rich in vitamins A, B, and D. I prefer to use cod-liver oil and brewers' yeast. They are the least expensive to the patient, and my experience is that the response is better than when the more expensive synthetic vitamin-concentrate compounds are used.

4. Treatment for the associated seborrhea of the scalp and eyebrows should be instituted at the same time. If a dermatologist is not available, a scalp tonic that

* Greenbaum. Seborrheal blepharitis. *Arch. of Ophth.*, 1934, v. 11, April, p. 604.

contains salicylic acid and resorcin in alcohol can be applied daily, followed up by biweekly shampoos and massage.

Both local and general treatment must be carried out over a long period of time, as in the treatment of any chronic disease. The patient should be seen once or twice weekly in the beginning, the interval between visits lengthening as the patient improves. Recurrences are common, for most patients stop treatment as soon as their symptoms subside; but for those who persist, permanent relief from symptoms can be effected. I report the following case:

L. P., white, aged 63 years, by occupation a railroad agent, came under my care in May, 1931. His lids were twice the normal thickness, the margins ulcerated, and there were not more than a dozen cilia remaining on either of the lids. The conjunctiva was thickened and chronically inflamed. He was unable to carry on his work due to the irritation and accumulation of mucus in the conjunctival sacs. The treatment as outlined was instituted, and by January, 1932, his symptoms had entirely subsided. Cilia had grown in again, and the lids and conjunctivae were

free from inflammation and appeared entirely normal. The patient reports to me at intervals of two to three months for office treatment, and has remained subjectively and objectively normal.

I report this case, not as proof of the effectiveness of the method of treatment advocated, but because it was the most severe case that has come under my observation. This patient had been treated for years with yellow-oxide-of-mercury ointment, had had silver nitrate applied until he has a mild argyria, and had had his glasses changed many times, all to no avail.

CONCLUSIONS

1. Seborrheic blepheroconjunctivitis is a more prevalent problem than the ophthalmological literature indicates.

2. It is amenable to treatment that can be administered by any eye physician without the use of expensive additional equipment.

3. The treatment must be carried out over a long period of time. Recurrences are to be expected, but persistence and patience in treating this condition will be rewarded.

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CONCERNING CONDITIONS SIMULATING AN INTRAOCULAR TUMOR

A CORRELATION OF CLINICAL AND HISTOLOGICAL FINDINGS

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A certain percentage of eyes removed for suspected intraocular new growth actually do not contain a tumor. An analysis of the clinical symptoms and their correlation with the histopathological findings is of particular interest in these cases.

Several conditions frequently leading to clinical tumor diagnosis are discussed with the following delineation of pertinent cases.

Case 1. A boy, seven years of age, accidentally discovered that he had poor vision in the right eye one month prior to the first examination. The eye had never been inflamed nor painful.

Clinical findings. Vision in the right eye was ability to detect hand movements eccentrically; in the left eye 1.2. The right eye, very slightly smaller than the left, had a normal anterior segment. In the fundus (fig. 1) were extensive, ill-defined, slightly prominent, yellowish-white areas, beginning at the disc and following the main distribution of the retinal vessels, always lying underneath them. The macular area was discolored in a similar way; the fovea centralis appeared dark gray, and was partly covered by fluffy white masses. In the lower periphery was a detachment of the retina several parts of which were grayish-brown and rigid. In two places—one in the inferior, nasal quadrant, the other in the temporal periphery—there were numerous aneurysms and vascular convolutions. The retinal vessels elsewhere and the optic disc were normal. The transillumination was somewhat dull from below. The intraocular tension was normal. The left eye was apparently normal.

A tentative diagnosis of external, exudative retinitis (Coats¹) was made, but the eye was removed, for in view of the rigid, dark appearance of parts of the detached retina and the impaired transillumination a new growth could not be ruled out completely.

Immediately after the enucleation the eyeball was cut into halves just nasally to the optic papilla. The white areas were found to extend to the ora serrata. Eight millimeters below the macula, there was a 10×10 mm. cyst having clear walls and a clear interior that permitted a good view of the underlying choroid.

The main histopathological findings in this eye were: 1. A moderate amount of a homogeneous transudate. 2. Vascular changes, consisting of angioblastic proliferations and aneurysms. 3. Extensive accumulations of fatty granular cells in the subretinal space and in the outer layers of the retina. 4. Disseminated, large, mainly hyaline masses resembling psammom bodies.

The transudate was found in the inferior peripheral retina only, mainly within the cyst and in its immediate neighborhood. One cyst was intraretinal and originated through splitting of the retina along its outer plexiform layer. Along the posterior wall of the cyst there was a moderate amount of free hemorrhage. The walls of the cyst and the adjoining retina contained the aneurysms and new-formed blood vessels. The aneurysms were of the dissecting type, showing a tubular detachment of the endothelium (fig. 2). Throughout the lower retina the capillaries in the inner plexiform and nuclear

layers appeared to be increased in number and had thickened walls.

The fatty granular cells (fig. 3) were found throughout the fundus, in the upper half within the subretinal space only; in

the lower half, particularly surrounding the cyst, also in the outer layers of the retina. They were responsible for the extensive whitish discoloration of the fundus. Where they infiltrated the retina

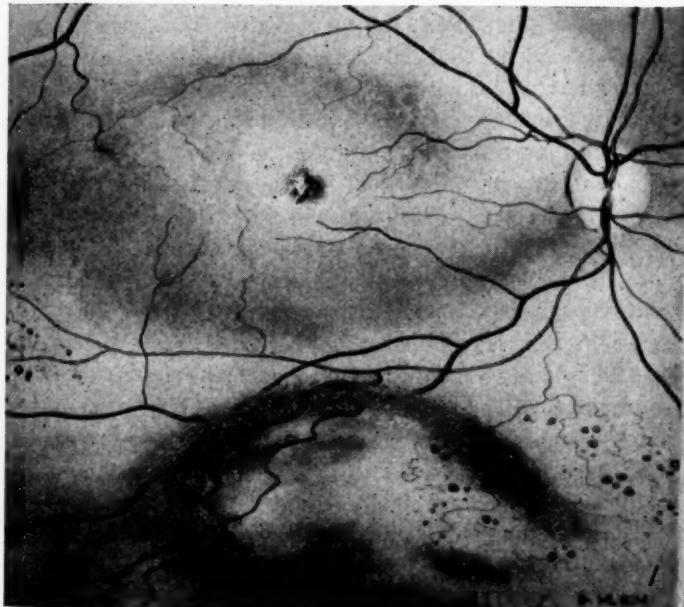
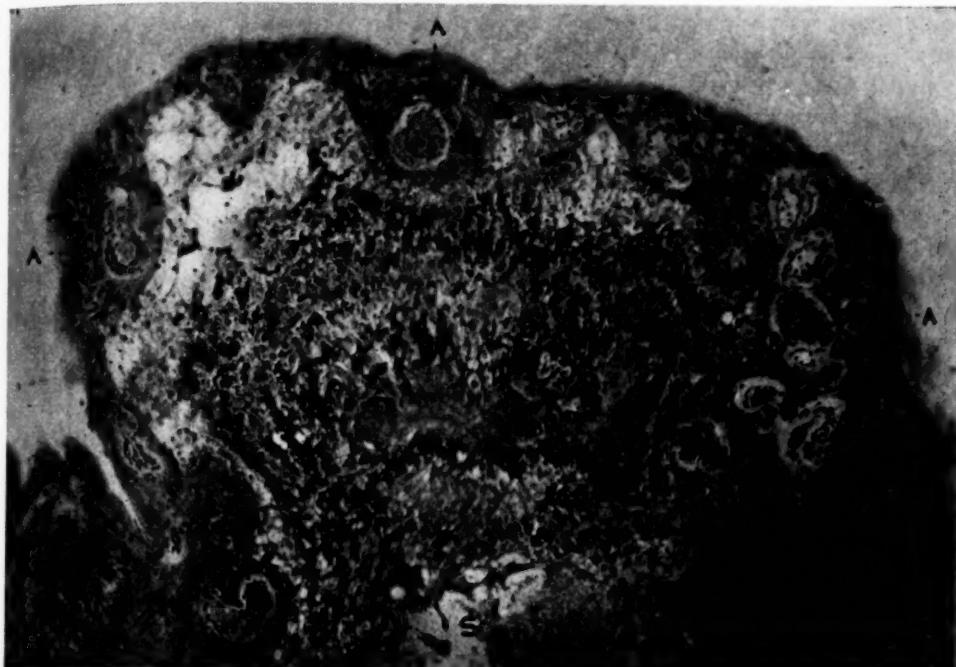


Fig. 1 (Klien). Case 1. Fundus of the right eye in a seven-year-old boy (Coats's disease).

Fig. 2 (Klien). The same eye as in figure 1. The temporal wall of the cyst. A, dissecting aneurysms and vascular convolutions; S, splitting of the retina.

there was a marked degeneration of the first neuron that manifested itself in the absence of rods and cones, the rarefied outer nuclear layer, and a very narrow outer plexiform layer. It is this degeneration of the first neuron which predisposes to the splitting of the retina along the outer plexiform layer and thus to formation of large cysts. Where the fatty granular cells were limited to the subretinal space the neuroepithelium was well preserved.

In this connection the origin of the fatty granular cells in general is of interest. They may be derived from the pigment epithelium, from the Hortega cells or microglia, or from Müller's supporting cells, which resemble the microglia. These three types of cells have most of the properties of the reticulo-endothelial system, particularly the faculty for migration and phagocytosis. The phagocytic property of the pigment epithelial cell comes to light only when it is separated from the continuity of the pigment epithelium, and it does not include phagocytosis of fuscine, the original pigment of the cell, while the two other cell types have a great affinity for fuscine. This is of interest when one attempts to determine the origin of a fatty granular cell in a particular instance.

The chronological sequence in which the process of fatty degeneration attacks these three types of cells is also known. The Hortega cells degenerate first, then the pigment epithelial cells, and last the cells of Müller.

In the eye under discussion the pigment epithelium appeared to be the main source for the fatty granular cells. They were large, vesicular cells, most of them still containing their nuclei and a varying amount of fuscine needles, homogeneously distributed throughout the cell body. Numerous kidney-shaped cells with two nuclei indicated that they multiplied by

direct cell division. In many places a pigment epithelial cell could be observed just leaving the continuity of the epithelium, some already containing two nuclei. Other signs of the activity of the pigment epithelium were Drusen-like bodies, which, however, were not hyaline material but cell proliferation between the lamina basalis and the epithelium.

The psammomlike bodies had a very conglomerate appearance, containing narrow slits and canals filled with cell proliferations, pigmented phagocytes, giant cells, capillaries, and a few cholesterol crystals. Between those slits there was partly hyaline partly fibrous material. The largest one occupied the macula, projecting inward above the level of the retina. Its inner pole was partly covered by a thin layer of fibroblasts. Its pigment content was responsible for the dark appearance of the fovea clinically (fig. 4).

For the origin of the psammomlike bodies two etiologic factors are suggested by the findings in this eye. Some of them seem to originate from preformed convolutions of blood vessels whose walls undergo a progressive hyaline degeneration, and whose adventitia—and endothelial cells—accumulate phagocytized material within them. Others appear to be organization products of hemorrhage or exudate, and these always include a large number of fatty granular cells. There was no pigmentation in or around the cyst. The dark-brown appearance of the cyst clinically was only an optical phenomenon due to its depth and transparency. The clinical diagnosis of Coats's disease was confirmed by the histologic examination.

Case 2. A man, 36 years of age, had had a divergent squint in the left eye and poor vision in this eye as long as he could remember. Several weeks prior to the eventual enucleation the eye had become inflamed and painful.

Clinical findings: Vision in the right eye was 1.2; in the left eye, nil. The right eye was apparently normal.

There was a mixed injection of the left bulb; the cornea was steamy; the pupil 5.5 mm. in size (atropine mydriasis) and irregular due to several posterior synechiae. An incipient complicated cataract and a complete retinal detachment were discovered. The intraocular tension was 54.0 mm. Hg (Schiötz). The transillumination of the globe was good except in two small places, one at the 6-o'clock position just in front of, and the other at the 2-o'clock position just behind the equator.

The secondary glaucoma in this eye could not be influenced by any medication, and the eye was enucleated because of persistent pain and because the combination of glaucoma and retinal detachment suggested the possibility of an intraocular tumor.

The main histopathologic findings in the anterior segment were an extensive peripheral anterior synechia of the very atrophic iris. The ectropium of the pupillary margin and the proliferation of the endotheliumlike anterior-border-layer cells of the iris indicated an old glaucomatous status.

In the posterior segment there was a complete low retinal detachment. The subretinal space and several large cystic spaces in the outer layers of the retina were filled with a homogeneous transudate that was surrounded by fatty detritus and globular shadow cells. There were complete gliosis of the peripheral retina and a marked degeneration of the posterior retina with complete destruction of the first neuron. Numerous vascular convolutions, some of them with aneurysms, were found in the inner nuclear and plexiform layers. In two places, one near the superior, the other near the inferior ora serrata, there were hemorrhages in the

retina and the adjoining vitreous. These two places corresponded to the areas that had poor transillumination clinically.

Psammomlike hyaline bodies were scattered throughout the retina. On the outer surface of the retina was a thick glial membrane which in one place extended through a crack of the lamina basalis into the choroid, where it contained a plate of bone. Bone formation in Coats's disease, the diagnosis given to the condition in this eye also, is rare and has been reported only once (by Axenfeld²).

While in the first eye a relatively early stage of Coats's disease could be demonstrated the second eye illustrates its terminal phases. Through rupture of the intraretinal cysts a retinal detachment arises, which eventually leads to iritis, cataracta complicata, and secondary glaucoma.

If discovered in the early stage, usually by chance, differential diagnosis from angiomas retinae (v. Hippel-Lindau's disease) has to be made. Unilateral occurrence and a thorough medical and neurological examination with negative results, and remaining so for several years, excludes v. Hippel's disease.

If a retinal detachment complicates the earlier stages of Coats's disease, and it is discovered in childhood, the differential diagnosis from retinoblastoma has to be made. The discovery of aneurysms and whitish plaques upon the detached retina will, together with good transillumination and the absence of typical calcified foci in the roentgen picture, speak for Coats's disease.

If the late phases of Coats's disease are encountered, the question of an intraocular tumor will invariably arise. Thus the prognosis of Coats's disease is not only poor as far as vision is concerned, but also regarding a comfortable and cosmetically satisfactory eye.

Case 3. A man, 32 years of age, noted loss of vision in the inferior temporal quadrant of the right eye two years prior to his first examination. The defect gradually extended to the inferior nasal quad-

tion; in the left eye, 1.2. The left eye was apparently normal.

In the fundus of the right eye there was an extensive, translucent retinal detachment over the entire upper half, extend-

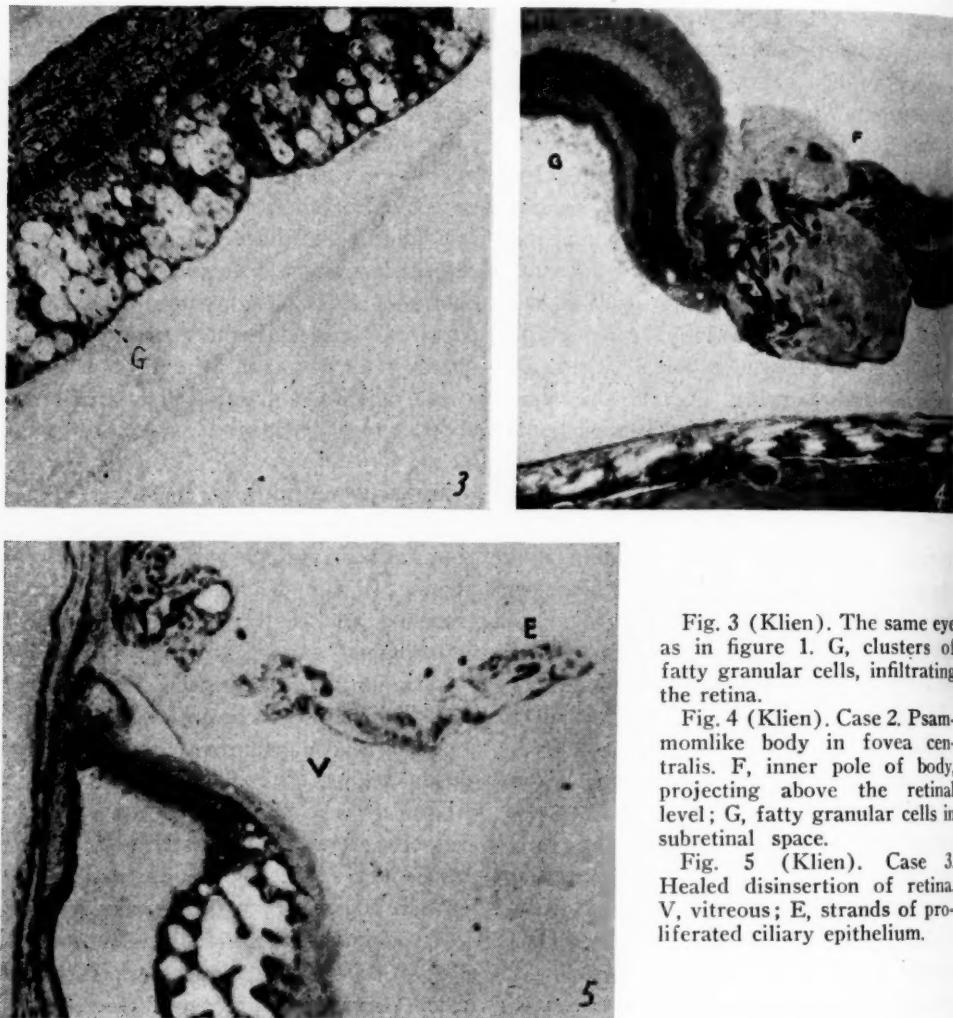


Fig. 3 (Klien). The same eye as in figure 1. G, clusters of fatty granular cells, infiltrating the retina.

Fig. 4 (Klien). Case 2. Psammomlike body in fovea centralis. F, inner pole of body, projecting above the retinal level; G, fatty granular cells in subretinal space.

Fig. 5 (Klien). Case 3. Healed disinsertion of retina. V, vitreous; E, strands of proliferated ciliary epithelium.

rant, so that a right-sided inferior hemianopic defect resulted. At the time of the first examination the patient had already begun to have attacks of pain in this eye and headaches on the right side.

Clinical findings. Vision in the right eye was light perception, with faulty projec-

ting into the macular area. The intraocular tension fluctuated between 25 and 35 mm. Hg, and at various times there was an increased cell content in the aqueous.

Suspicion of an intraocular tumor was expressed by several examiners, although the transillumination was satisfactory in

all directions. During the three months prior to the enucleation a cataracta complicata developed, and the pain continued in spite of atropine and adrenalin medication.

The measurements of the enucleated eyeball were: sagittal, 26.0 mm.; vertical, 24.5 mm.; frontal, 24.0 mm.

The main histopathologic findings in the anterior segment were a short anterior

hind the original insertion. The resulting gap was partly filled with vitreous, partly with irregular proliferation of unpigmented ciliary epithelium, some of which extended as short strands into the surrounding vitreous. There was no interruption in Bruch's membrane. Of interest was the extremely oblique course and entrance of the optic nerve in a nasotemporal direction as in a myopic eye. The ver-



Fig. 6 (Klien). Case 4. Right fundus of 65-year-old man. Spontaneous choroidal detachment.
Fig. 7 (Klien). The same eye as in figure 6. Histologic picture.

peripheral synechia, some cell débris in the spaces of Fontana, and a few short posterior synechiae.

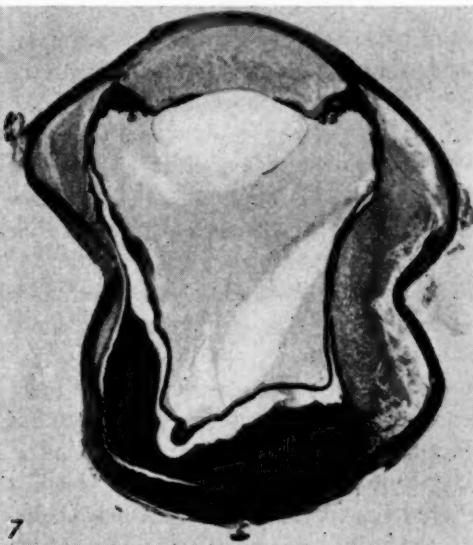
In the posterior segment there was a low retinal detachment together with extensive cystoid degeneration of the retina not only in the periphery, but also around the optic nerve and in the macula. At the upper ora serrata evidence was encountered of a healed retinal disinsertion through 25 series, indicating a former defect of about 5.0 mm. in length. The retina had been torn off at the ora (fig. 5) and later reattached about one millimeter be-

tical sections through the eye showed only cross sections of the nerve. This together with the slightly enlarged measurements of the bulb suggests a low-grade axial myopia.

Case 4. A man, 65 years old, complained of redness and pain in his right eye for 12 days prior to his first examination. No previous similar attack had occurred.

Clinical findings. Vision in the right eye was the ability to count fingers at 2 feet; in the left eye, 0.8. Findings in the left eye were normal.

In the right eye there was a mixed in-



jection of the bulb and the posterior surface of the cornea was covered with uniform, fine gray deposits of crystalline appearance. The anterior chamber was very deep and the aqueous homogeneously cloudy. A few pigment deposits were applied to the anterior lens surface and there was a marked iridodonesis. The vitreous was cloudy. In the superior periphery a dark, grayish-brown rigid mass projected downward (fig. 6). In its neighborhood a few round, deeply pigmented, old chorioretinitic areas were visible. The intraocular tension at that time was 10 mm. Hg (Schiötz). The transillumination of the bulb gave a slight shadow in the region of the dark elevation. The visual field taken with a 10.0-mm. test object did not show any contraction at that time.

During the following two months attacks of acute hypotony alternated with rises of intraocular tension up to 28 mm. Hg. During the hypotonic periods, the anterior chamber was very deep and there was marked iridodonesis. Both symptoms disappeared between the attacks. The dark-brown mass could be observed unaltered for six weeks, after which period an extensive retinal detachment developed.

A tentative diagnosis of spontaneous choroidal detachment followed by retinal detachment was made, but continuous pain and the thought of a possible tumor finally necessitated enucleation.

The most striking histological findings were those produced by the state of hypotony in which the eye was removed. There were: 1. An extremely deep anterior chamber due to a retrodisplacement of the middle portion of the iris, leaving the chamber angle wide open. 2. Marked hyperemia of the iris, within which there were many new-formed vessels and disseminated small free hemorrhages. 3. A detachment of ciliary body and choroid extending backward over the equatorial

region (fig. 7). 4. A vicarious retinal detachment throughout the posterior segment. The subchoroidal space and the anterior chamber were filled with a granular exudate between a network of finest threads. 5. Marked dilatation of the choroidal vessels. 6. Detachments of the unpigmented ciliary epithelium forming so-called Greeff's vesicles.

Small, inconspicuous foci of round-cell infiltration were scattered throughout the uveal tract and accompanied the long posterior ciliary nerves, a feature that may explain the patient's constant pain in this eye. In the superior equatorial region a retinal tear was found, and in its neighborhood there were old chorioretinal adhesions with large plates of glia in the choroid. In spite of the frequent attacks of hypotony there was no posterior vitreous detachment, but a firm contact between vitreous and retina throughout. The clinical diagnosis of spontaneous choroidal detachment was confirmed by the histologic examination.

SUMMARY AND CONCLUSION

In three different conditions suspicion of an intraocular new growth was raised by the following clinical symptoms: 1. A more or less extensive retinal detachment. 2. A rise in intraocular tension that could not be controlled by medication and that in two of three eyes had a fluctuating character. 3. Circumscribed, poor transillumination of the eyeball in one or more places in three of the eyes. 4. The discovery of rigid, circumscribed, dark-appearing elevations which could not be interpreted correctly in two eyes in which the fundus was visible.

In regard to the first symptom, the retinal detachment was twice due to Coats's disease, once it followed a small disinsertion of the retina in an apparently slightly myopic eye, and once it was preceded by a spontaneous choroidal detachment.

As to the second symptom, the secondary glaucoma that was present in three of the four eyes was due to an obstruction of the chamber angle, consisting of iritic adhesions in two eyes. In the third eye, which had a wide-open angle, it was possibly due to the nature of the exudate that blocked the spaces of Fontana temporarily between the hypotonic periods.

In connection with the third symptom, the areas of poor transillumination in one of the eyes corresponded to histologically found areas of hemorrhage in retina and vitreous. The dullness in the two other eyes may have been due to partial dispersion of the penetrating rays by the smooth, round posterior surface of the cyst and the equally smooth, pigmented and rigid,

curved surfaces of the choroidal detachment.

Finally, the dark appearance of the circumscribed elevations ophthalmoscopically was an optical phenomenon in the eye with the large cyst and due to the pigment epithelium of retina and ciliary body in the eye with the choroidal detachment.

I do not wish to give the impression that the enucleation of any of these eyes should or could have been avoided. Once a secondary glaucoma complicates the conditions just demonstrated, the prognosis as to keeping a useful or comfortable eye is poor, and once a clinically well-founded suspicion of an intraocular growth has arisen, the eye is best removed.

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SPONTANEOUS RUPTURE OF THE LENS CAPSULE IN HYPERMATURE CATARACT CAUSING SECONDARY GLAUCOMA

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Review of the recent literature on the subject of morgagnian cataract impresses one with the steadily decreasing frequency. The older literature indicates that this condition was of frequent occurrence, and Morgagni, who first described the physical characteristics, assumed them to be those of cataract in general.¹ In present-day practice morgagnian cataracts are much less often seen, although cataracts of varying degrees of hypermaturity are still frequently found. It is not uncommon at operation to observe the escape of a milky fluid, as the capsule is incised, followed by a small nucleus. The term morgagnian cataract has reference only to a clinical form and not to a specific pathologic change in the lens.

The complications of hypermature cataract usually manifest themselves in the form of a secondary glaucoma. If the onset happens to be acute, the patient seeks advice before serious damage has been done. If, however, the onset is insidious, damaging pressure may be present for so long a time that light perception has disappeared.

The initiation of this process in many of these cases is the escape of lens substance into the anterior chamber through rupture of the lens capsule. It is well known that the lens substance may be absorbed through an intact capsule; of this there are numerous reported cases. The development of glaucoma in connection with spontaneous absorption was observed by von Reuss, who reported 34 cases, four of which were complicated by glaucoma.² H. Gifford and other observers have shown that the glaucoma was secondary.³ The case to be reported is of

a special interest as the rupture in the capsule was diagnosed on the basis of external findings and later substantiated by examination with the slitlamp.

Case report. Mrs. K. K., aged 67 years, white, complained of severe pain in the left eye, swelling of the left upper lid, and redness. Her past history was interesting in view of its comparative completeness. Forty-five years ago the patient suddenly noticed that the left eye was blind. Dr. Lewis of St. Louis diagnosed an inactive choroiditis. Twenty-three years ago the diagnosis of mature cataract was made by Drs. North and Donnell. At this time there was no light perception. Their records are available. Operation was optional and decided against by the patient. Last July a relative noticed a sudden increase in the size of the white spot in the pupil. The patient consulted Dr. Alfred Cowan in Philadelphia, who advised enucleation. The first report of such rupture of a thin capsular wall was reported by A. V. Szily.⁴ Since then a number of cases have been reported, the references to which are listed.⁵

I first saw the patient September 16, 1936. The right eye showed no abnormalities. Vision with correction was 20/20. The left eye showed some edema of the upper lid, mild pericorneal injection, and a regularly dilated pupil, which was filled with a white mass extending into the anterior chamber. Slitlamp study revealed no structure in the mass but showed very many shining crystals floating in the aqueous. These were thought to be cholesterol, having their origin in the disintegrating lens substance. The

cornea was entirely clear, although the most anterior portion of the lens mass rested against its posterior surface. The tension was 42 mm. Hg. There was no light perception. The anterior chamber was deeper than that of the other eye.

Three years previous to this time, the family physician, a competent man, had made a tentative diagnosis of pernicious anemia. The blood picture has never been typical and during the past year this in addition to evidences of an enlarging abdominal tumor have made this diagnosis doubtful. The question of malignant growth was raised but ruled out so far as the eye was concerned.

On September 28th, a corneal incision was made in the usual fashion, and wide iridectomy performed. Total collapse of the cornea was prevented by the solidity of the lens mass on which the center of the cornea rested. This was removed with wire loop and forceps with considerable difficulty. Irrigation of the anterior chamber lifted the lens nucleus from the bottom of the capsular sac, and it was brought out easily. The patient left the hospital on the eighth day with a tension of 20 mm. Hg.

Slitlamp examination showed a vertical tear in the anterior capsule, the edges

of which were quite regular and considerably thickened.

Two months after operation the eye was quiet, the tension 20 mm. Hg, and the aqueous clear. Details of the fundus were clearly made out and a massive retinal scar with total optic atrophy was seen.

It seems possible that many of the cases reported as spontaneous absorption of cataracts complicated by glaucoma have truly been caused by a rupture somewhere in the capsule. An acute onset with a milky aqueous would arouse such a suspicion.

The exact role of lens substance as the cause of the glaucoma complicating the absorption of lens matter is still disputed. That the reaction in cases of morgagnian cataracts is more severe than that following the needling of soft cataracts has been observed. It must be remembered that most morgagnian cataracts occur in advanced age, soft cataracts being invariably juvenile or presenile, the facility with which absorption and drainage take place differing remarkably in the two instances. Therefore, blocking of the angle must be considered a cause in precipitating a rise in intraocular tension.

Murphy Building.

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REFRACTIVE ERRORS IN THE SAME EYES UNDER SCOPOLAMINE AND UNDER ATROPINE CYCLOPLEGIA*

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Chicago

A comparison of the refractive changes in eyes under the cycloplegic effect of homatropine and atropine appeared in 1932.† This study conclusively showed atropine to be a better cycloplegic because every sixth meridian in hyperopic eyes had 0.75 D. more hyperopia; every seventh myopic meridian 0.61 D. less myopia, and 21 percent of all eyes with mixed astigmatism under homatropine were hyperopic under atropine. Because the cyclo-

141 with myopia, and 59 had mixed astigmatism. The cases are divided according to the age group in the tables presented. Group A includes the patients under 20 years of age, B those between 20 and 40 years, and C those more than 40 years old.

TECHNIQUE

All eyes were subjected to skiascopy from a distance of one meter, using a concave mirror. Two drops of scopolam-

TABLE 1
CHANGES IN TYPE OF REFRACTIVE ERRORS

Groups*	Myopia to Emmetropia			Myopia to Mixed Astigmatism			Myopia to Hyperopia			Mixed Astigmatism to Hyperopia			Emmetropia to Hyperopia		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Number of Eyes	1	6	0	0	7	0	3	5	0	8	11	1	0	4	2
Total Number		7			7			8			20			6	
Percent		5.4			4.9			5.9			35			75	

* Group A includes the patients under 20 years of age; B, those aged 20 to 40 years; C, those over 40 years old.

Remained Emmetropic	B 2
Hyperopia to mixed Astigmatism	1
Mixed Astigmatism to Myopia	2

plegic effect of atropine was prolonged, I used scopolamine, whose action lasts from 60 to 72 hours, with the hope of finding a better drug than homatropine for refraction. In order to compare its value in refraction with atropine, both drugs were used on 400 eyes of 225 patients. There were 130 females and 95 males in this group, whose ages ranged from eight to 68 years. There were 200 hyperopic eyes,

ine hydrobromide in a 0.5-percent aqueous solution were instilled into the conjunctival sacs, with a 30-minute interval between drops, and the eyes examined 15 minutes later. The patients were instructed to make pressure over the tear sacs for eight to 10 minutes to prevent absorption of the drug, which may produce toxic effects. In a previous report‡ I found toxic action in 8 percent of cases. These occurred early in the study, before we insisted on pressure over the tear sacs. In the present group, 4 percent had toxic

* From the Division of Ophthalmology, The University of Chicago, Dr. E. V. L. Brown, director. Read before the Chicago Ophthalmological Society, December 21, 1936.

† Bothman, L., Arch. of Ophth., 1932, v. 7, March, p. 389.

‡ Bothman L., Illinois Med. Jour., March, 1937.

symptoms such as dizziness and a staggering gait. This figure includes three patients on whom a 2-percent solution was used due to an error by the druggist in making the solution. A dram of aromatic spirits of ammonia in water administered orally was sufficient to relieve the toxic symptoms in most cases. Rarely did dizziness persist after one hour. Atropine sulphate in 1-percent aqueous solution was used four times a day for three days and twice on the day of the examination (14 drops in all).

DATA

Table 1 is a record of the eyes that underwent a change in the type of refractive errors. Of eight emmetropic eyes, two remained so while six became hyperopic under atropine. Seven eyes myopic under scopolamine became emmetropic under atropine. Seven myopic eyes changed to mixed astigmatism and eight to hyperopia. Twenty eyes that had mixed-astigmatism errors under scopolamine were hyperopic under atropine. The percentages are shown in the table.

In 72 eyes, or 18 percent, the refractive errors were the same with both drugs. There were 13 myopic and five hyperopic subjects in this group who had only simple spherical errors. Fifty-four with compound errors were unchanged. In this group were 23 myopic and 21 hyperopic subjects between 20 and 40 years of age. Only six of the mixed-astigmatism eyes remained unchanged.

Of the 400 hyperopic meridians 244 or 60 percent averaged 0.37 D. more hyperopia, while 32 had less. No change was found in 124 meridians.

Of 282 myopic meridians 152 or 53 percent were 0.31 D. lower under atropine, 36 were higher, and 90 remained unchanged.

Of 118 mixed-astigmatism meridians 58, or 49 percent, averaged 0.21 D. higher,

27 were lower, and 33 were unchanged.

The differences in diopters of change per meridian is shown in table 3. There were 277 which had only 0.25 D. difference, 166 with 0.50 D.; 79 with 0.75 D., and 31 with more than 1.00 D. The greatest difference was in a hyperopic subject in group A, who had 1.75 D. more hyperopia under atropine. The greatest changes in all types of refraction were in patients under 40 years of age, groups A and B. There were only nine of 100 meridians with more than 0.50-D. change in group C (patients over 40 years) and seven of these were in hyperopic subjects.

CHANGES IN ASTIGMATISM

Of the hyperopic meridians 44, or 11 percent, required less cylinder strength under atropine; 79, or 19 percent, a stronger cylinder; and in 73, or 18 percent, the cylinder remained the same.

In 65 eyes, the axis of the astigmatism remained unchanged; in 32 the change was less than 15 degrees and in 85 there was more than a 15-degree change.

The astigmatism was with the rule 128 times in 165 eyes under scopolamine and in 137 of 170 under atropine.

Of the myopic meridians 35, or 24 percent, required weaker cylinders under atropine; 50, or 35 percent, required stronger ones; and 51, or 36 percent, were unchanged.

In 34 myopic eyes the axes of the cylinders were the same under both drugs. In 35 eyes there was a change of less than 15 degrees, and in 35 there was more than 15 degrees difference.

The astigmatism was with the rule in 55 of 98 eyes under scopolamine and in 59 of 99 under atropine.

Of the mixed-astigmatism meridians, 18 required less cylinder strength, 13 more, and 18 were unchanged.

The axis was unchanged in 17, the change was less than 15 degrees in 31, and

TABLE 2
CHANGES IN REFRACTION IN EACH EYE

* A = patients under 20 years; B = patients 20-40 years of age; C = patients over 40 years.

TABLE 3
CHANGES IN MERIDIANS OF REFRACTION, GROUPS A, B, AND C

Group*	No. of Cases	No. of Eyes	Meridians	Atropine > Scopolamine	Atropine < Scopolamine	Difference			Astigmatism with Rule		Less Cyl.	More Cyl.	Same Cyl.	
						+0.25	+0.50	+0.75	> +1.00	Aver.	Scopolamine	Atropine		
Hyperopia	31	53	106	81	20	5	43	21	16	.45	33/41	36/45	7	23
	78	118	236	137	80	19	78	47	24	.43	82/99	86/100	25	41
	15	29	58	26	24	8	19	5	2	.19	13/25	15/25	12	15
Total	124	200	400	244	124	32	140	76	45	.37	128/165	137/170	44	79
Myopia	20	33	66	0	18	48	18	8	4	.38	10/26	14/29	9	12
	55	99	198	40	62	96	67	46	14	.30	42/66	42/64	23	36
	5	9	18	0	10	8	5	3	0	.25	3/6	3/6	3	2
Total	80	141	282	40	90	152	90	67	22	.31	55/98	59/99	35	50
Mixed Astigmatism	11	16	32	22	7	3	15	5	5	.30	12/16	11/16	1	8
	24	31	62	35	16	11	24	14	5	.21	13/23	15/25	10	5
	8	12	24	1	10	13	8	4	2	.16	8/12	8/12	7	0
Total	43	59	118	58	33	27	47	23	12	.21	33/51	34/53	18	13
Grand Total	247	400	800	342	247	211	277	166	79	.33	216/314	230/322	97	142

* A = patients under 20 years; B = patients 20-40 years of age; C = patients over 40 years.

more than 15 degrees in 10 eyes.

The astigmatism was with the rule in 33 of 51 eyes under scopolamine and 34 of 53 under atropine.

Table 2 shows the changes in individual eyes. The significant figures are those for hyperopia, which show that 20.3 percent required a stronger sphere and a stronger cylinder under atropine; 13.5 percent required the same strength of sphere and a stronger cylinder, while in 15.6 percent both sphere and cylinder were unchanged.

In the myopic group the sphere was weaker and the cylinder stronger in 18 percent of the cases, and both sphere and cylinder were unchanged in 11 percent of all myopic subjects.

SUMMARY

Four hundred eyes were refracted while under the cycloplegic action of 0.5-percent scopolamine hydrobromide and of 1-percent atropine sulphate, and the results compared. In 18 percent of all eyes there was no change in refraction.

Myopia. Seventy-five percent of all emmetropic eyes became hyperopic under atropine; 5.4 percent of myopic eyes became hyperopic; 4.9 percent changed to mixed astigmatism, and 5.9 percent to hyperopia.

Fifty-three percent of all myopic meridians were 0.31 D. weaker under atropine; 72 percent of meridians in patients under 20 years of age were 0.38 D. weaker.

Twenty-five percent of all myopic eyes required a weaker sphere and stronger cylinder under atropine.

Every eighth meridian was 0.75 D.

weaker under atropine.

Hyperopia. Fifty-three percent of the hyperopic meridians required 0.37 D. higher correction under atropine. In patients under 20 years the average difference was 0.45 D.

In 16 percent there was no difference in refraction with the two drugs.

Every seventh meridian had a 0.75-D. increase under atropine.

Mixed Astigmatism. Thirty-five percent of mixed-astigmatism correction under scopolamine became hyperopic under atropine.

Forty-nine percent of all meridians were 0.21 D. higher under atropine.

Twenty-three percent of the minus meridians were higher under atropine.

CONCLUSIONS

Scopolamine is not so complete a cycloplegic as atropine.

The findings under scopolamine closely approximated those for atropine. In 18 percent of the examined eyes there was no change. The difference in hyperopia was 0.37 D. less and in myopia 0.37 D. more than under atropine. The average difference in 400 eyes was 0.33 D. The difference between findings in patients over 40 years of age was almost negligible.

Scopolamine is not a trustworthy cycloplegic when used for patients with good unaided vision if weak myopic or mixed-astigmatism errors are found, nor in patients under 16 years of age. Such patients should be refracted under atropine.

122 South Michigan Avenue.

NOTES, CASES, INSTRUMENTS

INJECTION OF AIR INTO THE ANTERIOR CHAMBER AFTER CATARACT EXTRACTION*

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Chicago

One of the disagreeable and not uncommon sequelae of lens extraction is the failure of the anterior chamber to become restored for several days or longer. Because of the shallow anterior chamber there is a forward displacement of the hyaloid-iris diaphragm which may lead to mechanical blockage of the chamber angle by the root of the iris, thus bringing about an increased intraocular pressure. Secondary glaucoma may also be brought about by a rupture of the anterior border layer of the vitreous, permitting vitreous to block the chamber angle. Prolapse of the iris is another unpleasant postoperative complication brought about by the disturbed mechanical relations following extraction of the lens.

Several years ago I saw Professor Elschnig inject air into the anterior chamber for collapsus corneae after lens extraction in order to restore the normal shape of the cornea. It seemed to me that a similar procedure adopted as a routine in cataract surgery might prevent complications such as secondary glaucoma and iris prolapse by restoring the normal relations in the anterior segment and giving the iris-hyaloid diaphragm a chance to become adjusted to the new conditions. A corneoscleral or other form of suture is a necessary preliminary for the injection of air into the anterior chamber. In the past year this procedure was carried out in 22 cataract operations. Twelve of these were intracapsular, ten extracapsu-

lar. One of the latter was a linear extraction. There were four round-pupil extractions (without a peripheral iridectomy) and 18 with a combined total iridectomy. Sufficient air was injected to make the anterior chamber very deep—deeper than it normally is in order to fill not only the space occupied by the aqueous but also a part of the space formerly occupied by the lens. The air bubble remains quite large for the first two or three days and becomes completely absorbed on the sixth or seventh day. The formation of aqueous is not interfered with, as evidenced by the large amount of aqueous seen on the second day after operation. The air bubble floats freely on top of the aqueous.

The procedure is as follows: After retrobulbar injection of novocaine-adrenalin, akinesis, and subconjunctival injection, a corneoscleral suture is placed. The section is made, and the lens extracted either in the capsule or by the extracapsular method through the round pupil or through an operative coloboma of the iris. After the extracapsular extraction the anterior chamber is irrigated with normal salt solution. The corneoscleral suture is tied and the iris is repositioned. The edge of the small marginal flap is carefully replaced so that no part of it remains rolled under between the lips of the incision, as this would permit air to escape. Sterile air is drawn into a Goldstein irrigator. The air is sterilized by aspirating while the blunt tip of the irrigator is held in the flame of an alcohol lamp. The patient is directed to look straight up at the ceiling and the tip, first cooled by dipping it into normal saline solution, is inserted into the anterior chamber near the nasal or temporal extremity of the corneal incision, so that it rests on the iris. Care must be taken

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lest the tip be introduced into the pupillary space or into the area of the iris coloboma, as it would be possible to perforate the hyaloid membrane and thus lose vitreous. This can easily be avoided by not permitting the tip to go beyond the iris. The bulb of the irrigator is then compressed with sufficient force to inject a large bubble of air into the anterior chamber and the tip is carefully withdrawn. If the anterior chamber has not become very deep the maneuver is repeated. It may require three or four compressions before a sufficient amount of air is injected. A glass syringe with a blunt-tipped lacrimal needle may be used instead of the Goldstein irrigator. No instruments, such as the iris repositor, should be introduced into the anterior chamber after a proper-sized air bubble has been obtained, as otherwise the air will escape. The usual dressing is then applied.

In none of the cases was there any loss of vitreous nor any infection. The post-operative course in all but one patient was uneventful. This patient developed a prolapse of the iris on the third post-operative day. The prolapse was probably a result of several factors. The corneal section, made by a junior member of the staff, was technically faulty. It was partly scleral and partly corneal and the iris prolapsed over the knife during the incision so that an iridectomy was performed with the knife. This resulted in a coloboma which was narrow at the iris root and wide in the pupillary area. In addition to this there was a rather wide conjunctival flap which bled so freely that the repositioned flap was elevated by a large blood clot. Removal of the clot resulted in fresh bleeding and for that reason further attempts to keep blood clots from raising the flap were abandoned. The injected air escaped almost entirely by the second postoperative day.

On the fifth postoperative day the iris prolapse was excised with no loss of vitreous and a conjunctival flap was drawn over the cornea. Another patient who was very restless after the cataract operation expelled the air bubble on the first postoperative day but made an uneventful normal postoperative recovery.

CONCLUSIONS

Injection of sterile air into the anterior chamber after cataract extraction causes an immediate restoration of the anterior chamber. By pressing back the iris-hyaloid diaphragm the air prevents blockage of the chamber angle and may prevent postoperative complications, such as secondary glaucoma and iris prolapse.

58 East Washington Street.

THE EVOLUTION OF FLASH PERIMETRY*

LEO L. MAYER, M.D.
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Some six years ago we in the Department of Nervous and Mental Diseases of the Northwestern University Medical School became interested in the subject of chronaxia. My interest most naturally was directed to an attempt to understand and measure the chronaxia of the optic nerve. As is well known, the theory of chronaxia, according to Lapique, is a method of measuring the shortest duration of a stimulus whose minimal impulse will result in perception or a reaction to the stimulus. With these thoughts in mind a mechanical apparatus was constructed which developed a flash of light whose shortest duration was 1/33,000 of a second. A description of the apparatus and

* Presented before the Chicago Ophthalmological Society, December 21, 1936. From the Departments of Ophthalmology and Nervous and Mental Diseases of the Northwestern University Medical School.

the results obtained therewith were published in the Archives of Ophthalmology in March, 1933. It was surprising to note that the maximum flash obtained was readily perceived by the macular area and indeed as far out as the 50-degree meridian to the temporal side of the field in the horizontal axis.

Now deviating from the subject of chronaxia our attention was given to this newly found phenomenon, the inability of the peripheral retina to perceive rapid flashes of light.

A new method was devised whereby a neon lamp activated by dry-cell batteries from which condensers were discharged at a rapid rate gave light flashes of $1/25,000$, $1/50,000$, $1/75,000$ and $1/100,000$ of a second. The neon lamp was arranged as the target with a 2-mm. opening and was constructed to ride on the arm of the ordinary Schweigger hand perimeter. A preliminary report of this method with the results obtained was published in the Proceedings of the Society of Experimental Biology and Medicine in October, 1934. Because of the weight of the many "B" batteries the instrument was found to be quite cumbersome, and in addition, one could not be sure of the strength of the discharge. The next advance was to eliminate the batteries entirely from the instrument and make it usable on the ordinary electric-light outlet. For the accomplishment of this idea it was necessary to consult an electrical engineer. We should like, at this time, to express our appreciation to Mr. Earl Choate of Maywood, Illinois, whose ingenuity and workmanship account for this newer type of instrument and its subsequent electrical modifications.

The first model evolved and the results obtained were published in the Archives of Ophthalmology in October, 1935. This instrument was light in weight, worked on direct or alternating current and gave

more critical visual fields than the ordinary method. Comparison on 10 normal eyes showed the flash method to delineate the field with the neon lamp flashing at $1/50,000$ of a second, approximately 5 degrees within that found by the ordinary 2-mm. white target. Also, because of the fact that the light from a neon lamp is red in color, a comparison was made with the field for red with the ordinary 2-mm. red target. There was no indication that these fields were similar, as the ordinary field for red is within that of the neon lamp from 10 to 20 degrees.

Perhaps the outstanding feature is the fact that hysterical or tubular fields due to functional conditions are not shown by

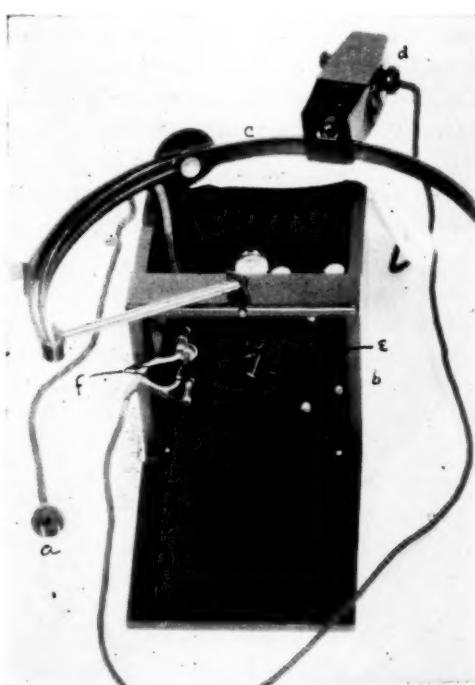


Fig. 1 (Mayer). Flash perimeter.

the flash method. Young children often show tubular fields but the flash method makes certain that there is no loss. When a pituitary tumor might be suspected it is essential that the extent of the temporal fields be known. If the pa-

tient has tubular fields with the ordinary test one may well realize the importance of the flash method in delineating a normal field. Quadrantanopia is rare and often missed or obscured by ordinary methods. The flash, however, reveals a clear-cut unquestionable defect. Comparison of bitemporal hemianopia easily demonstrated by ordinary fields shows a lessened tendency in the flash field to a spread in any portion of the temporal field. This is likewise true of a homonymous hemianopia investigated. In watching for the recovery of a field, after removal of the lesion causing it, the flash field has often been demonstrated to be a more critical and dependable prognostic agent. The Rönne step found in glaucoma, in our experience, has been recorded earlier and with greater ease by the flash method. No claim may be made that the neon-flash method is anything but a better and easier method of quantitative perimetry, and Dr. S. R. Gifford has demonstrated that a visual field made

with extreme care by the Bjerrum method on a very intelligent patient compares favorably.

The latest model pictured here is quite light and may be carried around easily and used at the patient's bedside. Its measurements are 6 x 6½ x 7½ inches and all equipment except the hand perimeter is included in the container. Figure 1 depicts the complete apparatus, showing at a, the plug for the wall socket; at b, the box containing the radio tube, condensers, and switch; at c, the ordinary hand perimeter with the neon tube at d riding in its housing. At e is a switch-board rheostat by means of which the rapidity of the flash may be regulated; at f are the three outlets converging into one cord which goes to the neon-lamp housing.

Models similar to this are in use by Dr. Hale Haven in the Tate Mason Clinic in Seattle and by Sir James Purvis-Stewart in London, England.

104 South Michigan Avenue.

SOCIETY PROCEEDINGS

EDITED BY DR. H. ROMMEL HILDRETH

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

SECTION ON OPHTHALMOLOGY

November 13, 1936

DR. W. L. BENEDICT, *president*

HYSERICAL BLEPHAROSPASM

DR. V. J. SCHWARTZ (Minneapolis) said that in hysterical blepharospasm both eyes close tightly and suddenly without prodromata and for no known reason. The duration and frequency of the closure vary greatly. The eyes are practically normal and the condition is encountered especially in young women. Other evidences of hysteria may appear. Pressure points or "trigger areas" may occasionally be found. These are areas upon which pressure causes the eyes suddenly to open. These pressure areas may lie anywhere in the region supplied by the fifth nerve, in the forehead, the cheek, the nasal cavity, the jaws, or the pharynx. Sometimes pressure areas may be far removed from the eye, although when present they are most commonly in the forehead.

Senile blepharospasm may be associated with other facial tics. It is either clonic and, therefore, characterized by rapid winking; or tonic, in which the eyes close tightly and remain so for periods varying from a few seconds to several minutes. Pressure points may occasionally be found in this type of case also. It is possible that this form of spasm may be a reflex response to irritation of some branch of the fifth nerve.

Mrs. H. R., aged 48 years, was seen in February, 1936, with the complaint

that the eyes shut suddenly and tightly at any time, especially in bright light. The closure lasts from one-half minute to four or five minutes; if she is walking she bumps into objects. She does not lose consciousness, but states that she "just cannot open her eyes." The frequency of these attacks varies from a few minutes to several hours. She is a rather nervous woman and is now in her menopause. This condition has been present about three years. She thought the right eye gave her more trouble than the left, but the demonstrator has never noted any difference. She had formerly worn glasses, but not for the past three years. There is an occasional slight earache, but no other facial tic. She thinks (and so does the demonstrator) that on fixing the gaze intently upon any object the eyes show a greater tendency to close than otherwise. The extent of her discomfort may readily be appreciated when one learns that these attacks of tonic spasm frequently overtake her while she is crossing a busy street.

Examination revealed practically no definite pathology in the eyes, ears, nose, or throat, except for a mild, chronic sinusitis, moderate obstruction of both Eustachian tubes, and the presence of medullated nerve fibers in the right fundus. There is one-half diopter of hyperopic astigmatism and one prism diopter of muscle imbalance vertically. She was given the necessary glasses and has been wearing them with comfort ever since, but without appreciably affecting her spasm.

Because of the mild sinusitis and the chronic, nonsuppurative otitis, the middle meati were shrunk, suction was applied, and the Eustachian tubes were inflated.

This was not done with any idea of relieving the ocular condition, but, after one such treatment, she insisted that her eyes felt better for several days thereafter. She returned a few times for similar treatment and stated that it relieves her for a number of days. The writer has been inclined to doubt that her spasm is relieved and has told her so, but her sinus and ear conditions are probably improved for a time. It is possible that the cocaineization incident to these simple treatments may find a pressure point somewhere, and the writer has repeatedly searched for a definite area of this kind, both inside and outside the nose and in the forehead, but so far has been unable to demonstrate one. Pressure on the supraorbital nerves seems to help, but at other times it does not. Cocainezation of each eye has no effect on the lid contraction.

There is some question as to how this patient should be classified. She is too young for the senile group and there are other evidences of neuroticism, some of which, at least, are probably associated with her menopause, since her complaint began about three years ago. Although the duration and incidence of her spastic attacks may typify either group, still, since she is a woman in middle life and presents no other tics, the demonstrator is inclined to believe that she belongs in the hysterical group rather than in the senile.

Discussion. Dr. W. L. Benedict (Rochester) said that one should distinguish between motor and sensory phenomena in hysteria. In some cases the field changes and diminished visual acuity may be the only ocular stigmata. In others, as in the case reported by Dr. Schwartz, motor changes such as blepharospasm may be present without visual changes. Rarely, motor and visual

changes may be present in the same patient. When only ocular motor changes are found, it is often difficult to rule out encephalitis and establish a diagnosis of hysteria.

ALLERGY IN RELATION TO OPHTHALMOLOGY

DR. ERLING W. HANSEN (Minneapolis) read a paper on this subject.

Discussion. Dr. H. W. Grant (St. Paul) said he did not recall that Dr. Hansen had mentioned the possibility of angioneurotic edema as an allergic manifestation, but Dr. Grant had seen this phenomenon several times, the individual being unable to open either eye after the consumption of various types of food. Sea food is oftentimes the basis for such attacks and complete relief has often been produced upon abstaining from this type of food.

In chronic allergic conjunctivitis there is one symptom that is helpful; namely, the stringy mucus that is always present and most annoying. By the use of a 1- or 2-percent solution of sodium carbonate, these symptoms may be quite completely relieved. A solution of 2- or 3-percent of sodium bicarbonate is also valuable in dissolving the mucus. The possibility that smoke can produce allergic conjunctivitis should not be forgotten. The so-called recurrent catarrhal ulcer usually seen at the limbus, which does not have a tendency to spread or become severely infected, is many times apparently due to allergy. Many patients with such conditions are subject to acute or chronic erythematous eczema. The attacks of ulcer may be associated with the eczema itself. As soon as the eye is covered and protected from the noxious agent that produced the eczema, the ulcer heals very rapidly; it recurs many times as soon as the eye is exposed again. Tem-

porary closure of the lacrimal duct is sometimes seen as a result of the allergic manifestation in the nasal cavity.

Walter E. Camp,
Secretary.

ROYAL SOCIETY OF MEDICINE,
LONDON

SECTION ON OPHTHALMOLOGY

December 11, 1936

MR. W. H. McMULLEN, *president*

RETINITIS PIGMENTOSA

MR. JOSEPH MINTON showed three cases exemplifying various types of this condition. In the first, a woman aged 31 years, complained of night blindness. Vision in both eyes was 6/12; but the fields in both were constricted to 10 degrees. The discs were yellowish, retinal arteries were narrowed, and in the periphery a few specks of pigment were visible. Her general health was good; there was no history of consanguinity in the parents, and no other members of the family showed abnormalities.

The next case was entitled retinitis pigmentosa cum punctata albescens. This woman, aged 28 years, complained of night blindness, which she had noted for three years. Both eyes showed full vision, but the right and left fields were constricted to 15 degrees. The retinal arteries were narrowed, and one could see the choroidal circulation. Pigment deposits were scattered in the periphery. The quantity of pigment had been increasing a year. Her general health was good; there was no history of consanguinity.

The next in the series was an eight-year-old girl, who complained of night blindness. Vision in both right and left eyes was 6/9; right and left fields were constricted to 10 degrees. The retinal arteries were very much narrowed, and the

choroidal circulation was visible. In both eyes could be seen fine pigment granules and large pigmented areas. In February, 1935, the patient showed white shining bodies in the periphery of the fundi, and a much smaller amount of pigment. The Wassermann test was negative, the general health good. No abnormalities were present in the remainder of the family.

CASE OF OXYCEPHALY SHOWING APERT'S SYNDROME

MR. GERSTMAN presented a boy, aged seven years, who had a broad, square-shaped skull, bilateral ptosis, ankyloblepharon, and syndactyly, the second and third, and fourth and fifth toes being webbed. There was no consanguinity of parents, but the familial relationship of the syndrome was shown by the syndactyly of the second and third toes of both feet of a female cousin of his father. Vision was good, there was no optic atrophy, and the boy was unusually bright.

He next presented a case of oxycephaly showing Crouzon's syndrome. This boy, aged 12 years, had oxycephaly and prognathism, high-arched palate, exophthalmos, coloboma of irides, and optic atrophy. Vision without glasses was 6/60 in each eye, with glasses O.D. 6/26, O.S. 6/18. He was somewhat dull for his age. His maxillae were ill developed.

LAURENCE-MOON-BIEDL SYNDROME

MR. AVERY and MR. ARNOLD SORSBY exhibited three cases of this condition. The first was in a boy, aged 16 years, whose parents were first cousins. There were five children of the marriage, all sons. Both the second and the fifth were affected in this way. The second had died of pneumonia last year, at the age of 23 years. The patient shown, the fifth son, demonstrated the complete syndrome;

that is, obesity, hypogenitalism, polydactyly, pigmentary degeneration of fundi, mental deficiency, and the recessive character of the affection.

The third case was in a girl, aged 17 years, whose parents were first cousins. Eight daughters and one son were the issue of the marriage.

STARGARDT'S DISEASE

MR. L. H. SAVIN showed a girl, aged 15 years, who presented typical pigmentary macular degeneration without other abnormal signs. The other members of the family were healthy; there was no consanguinity. In 1932 vision was 6/12. Central vision was now lost.

FAMILIAL DISTICHIASIS

MR. L. H. SAVIN next showed two children with this condition, aged three years and two years. The first was greatly troubled by pain and photophobia, therefore the posterior rows of lashes were excised by the speaker, and the raw areas on each lid were filled by mucous-membrane grafts from the lip. The photophobia was now relieved. Mr. Savin asked for suggestions as to treating the sister, whose lashes had not commenced to trouble her.

Discussion. Mr. C. Goulden advocated treating the lashes a few at a time by electrolysis.

OPHTHALMOPLEGIC MIGRAINE

MR. S. R. GERSTMAN presented a woman, aged 48 years, who had been having recurring attacks of migraine ever since her 14th year. At the time of the first attack the right eye diverged, and had not since returned to its normal position. In 1935, she had a very severe attack, for which she attended hospital, when she was found to have complete

right third-nerve palsy. There was now some weakness of muscles served by the third nerve. The ptosis had completely disappeared. With correction, the vision of the right eye was 6/12, left eye 6/6.

(*Reported by H. Dickinson.*)

COLORADO OPHTHALMOLOGICAL SOCIETY

December 19, 1936

DR. W. T. BRINTON, *presiding*

MULTIPLE FOREIGN BODIES IN CORNEAE FOLLOWING INJURY IN EXPLOSION

DR. W. M. BANE presented G. S., a miner, aged 25 years. On November 22, 1936, while drilling in rock, an undischarged stick of dynamite was exploded, peppering his eyes with fine white particles of talc. None of these particles seem to have entered the posterior segments of the eyes, but there are hundreds of fine and coarse white particles buried in each cornea at all levels. On two occasions some of the foreign particles were removed, but most of the white substance was either too deep or too pulverized to make removal possible. At one time, the anterior chamber was entered by the spud and further efforts at removal were not made.

At the present time, the eyes are less inflamed and they seem to be tolerating the foreign bodies much better. Vision is improving and is now better than 20/60 in each eye.

Discussion. Dr. Melville Black advised doing as little as possible in regard to the removal of fragments from the corneae because the eyes tolerate foreign bodies better than too much interference.

Dr. C. E. Walker, Sr., recommended removal of the particles time after time as they work to the surface, especially

near the pupillary areas of the corneae. The foreign bodies which lie deep in the corneal stroma peripherally should be let alone, in his opinion. He recommended an X-ray examination to determine whether there had been any penetration of the deeper structures of the eyes.

Dr. Frank Spencer expressed the opinion that enough of the foreign bodies had been removed and that the balance could be safely left. He referred to some explosion cases that had come to his attention, in which foreign bodies had remained embedded in the eyes for 25 to 30 years without much discomfort. The scarring that would result from further removal would be much more of a handicap to the patient than the foreign bodies still present.

Dr. W. H. Crisp said that, in his opinion, improvement is obtained by persistent removal of particles only up to a certain point. Then a point is reached where further removal is of no benefit. He referred to a case similar to Dr. Bane's in which vision improved 200 percent in four or five years, during which time the patient had had no treatment. The foreign material in this case seems to be rather inoffensive. Dr. Crisp stressed the fact that we must always consider the rôle which focal infection may play in keeping up the inflammation in eyes of this kind and mentioned a case of Dr. Libby's in which dental extractions brought about a quick subsidence of the inflammation in the eyes.

Dr. J. C. Strong said that the outcome depends largely on the material which enters the eyes. He mentioned one of his cases in which there were hundreds of small foreign bodies on the lens of both eyes and still the eyes were quiet and the patient had 20/30 vision. He has had a wide experience with injuries from explosions in the mines and has found that

the less treatment given, the better the end result. He removes foreign particles only when they work to the surface.

BONE FORMATION IN THE EYEBALL

DR. W. C. BANE showed sections of the left eye of Mrs. W. J. M., aged 40 years, who consulted him on October 29, 1936, because her left eye was periodically painful and inflamed and had been reduced in size for several years. The eye had been injured by being struck with a plank in 1916. Following this accident, there had been gradual failure in vision. When the eye was examined, it was found to be blind, atrophic, and soft, and removal was advised. The right eye was normal and had vision of 5/10 improved to 5/5—with lenses. On October 30, 1936, the left eyeball was enucleated and a gold ball implanted. A hard mass of bone was found in the posterior portion of the eyeball.

Ossification is not a rare condition in injured eyes where there has been severe uveitis and subsequent disorganization of the eye. It seems agreed that the term "ossification of the choroid, vitreous, and retina" is a misnomer and that the bone formation actually develops from connective-tissue elements, such as the organized exudate deposited on the inner side of the choroid. It usually starts near the entrance of the optic nerve and extends towards the ciliary body, often forming a complete osseous cup.

Discussion. Dr. W. T. Brinton reported a case of glaucoma in which both eyes were enucleated. Both showed bone formation in the posterior segment.

Dr. Melville Black mentioned a specimen in which the bone formation was so extensive that the lens was resting in bone.

Dr. F. L. Beck reported a shrunken painful eye with a history of injury 20

years previously in which the bone formation had squeezed the nerve to a diameter of two millimeters. The bone extended around the eyeball two thirds of the way.

ORBITAL TUMOR

DR. W. H. CRISP presented a man of 48 years who had come on account of increasing prominence of the right eye with diminishing vision. This eye was apparently normal to external and ophthalmoscopic examination, except that it was manifestly more prominent and about four millimeters lower in position than the left eye. The proptometer reading showed six millimeters greater prominence for the right eye. There was practically normal muscular balance as indicated by Maddox-rod test, and the movements of the two eyes were perfectly coördinated in all directions. The orbital margins were normal, but a firm resistance was encountered upon palpating some little distance within the orbital margin, from about the junction of the middle and outer thirds of the eyebrow to the external canthus. The corrected vision of the right eye was 5/7.5 and that of the left eye 5/4. The fundus showed no evidence of disturbance. An X-ray plate showed a diffuse area of partial bone absorption corresponding to the resistance encountered by palpation. There were no general symptoms which seemed to have a relation with the ocular condition, although the patient had been subject to occasional migrainous attacks for many years. An exploratory operation to obtain a specimen for biopsy had been recommended to the patient.

Discussion. Dr. Melville Black advised against the biopsy.

Dr. George Stine recommended X-ray radiation to wall off the tumor mass before proceeding with a biopsy. The upper fornix appeared to be drawn up markedly, probably by scar tissue and the patient

was in the age group in which malignancy is common.

Dr. Frank Spencer suggested performing a biopsy with a diathermy knife. He believed the mass to be a mixed tumor that is probably growing slowly.

Dr. W. T. Brinton recommended the use of the X ray. He believed the mass to be probably malignant because of the rough orbital margin. Pressure necrosis from a nonmalignant tumor leaves a smooth orbital rim.

Dr. Crisp reported that he had discussed the matter of X-ray therapy with Dr. Frank Stephenson who favored a biopsy first to determine whether the tissue is radio-sensitive. The tumor is slow growing as shown by the lack of disturbance of motility of the eye. A small biopsy would probably not be harmful. Dr. Stephenson suggested the possibility of a bone infection.

CATARACT FOLLOWING CHRONIC UVEITIS

DR. C. E. WALKER, JR., presented B. E., a W.P.A. worker, aged 25 years, whom he first saw on August 31, 1936. The patient complained that for two days he had had a sensation of a foreign body in the left eye. He gave a history of having had gonorrhea 10 years previously. His mother had had tuberculosis, which is arrested, and his father and mother were both living and well.

Examination showed marked ciliary injection of the left eye. The pupil reacted normally, and the fundus was seen clearly and was normal. Slitlamp examination showed a Descemetitis, many cells in the anterior chamber, and engorgement of the iris vessels. Vision of the right eye with -6.50 D.sph. \approx -0.75 D.cyl.ax. 150° was 20/20 and of the left eye with -6.50 D.sph. \approx -0.50 D.cyl.ax. 25° was 20/40.

Physical examination was negative except for large infected tonsils, which were

removed September 5, 1936. The Wassermann reaction was negative. Tuberculin tests were negative. Urinalysis was negative and X-ray films of the teeth were negative.

Treatment with 1-percent atropine three times a day, aspirin 10 gr. three times a day, and heat for 30 minutes three times a day was instituted, but the vision continued to fail, and on October 3, 1936, 25 million typhoid organisms were given intravenously. On October 17th, 40 million typhoid bacilli were given and on November 17th, this was repeated. On November 27th, the dosage was increased to 60 million. On November 17th, some coarse vitreous opacities were seen, and on November 27th, the lens capsule was noticed to have a small slit at about the 10-o'clock position. The slit in the capsule became larger, and a cataract developed. The patient was seen by Dr. W. M. Bane and by Dr. J. L. Swigert. On November 17th, the aspirin was stopped and potassium iodide given, 30 drops daily.

HEREDITARY CONJUNCTIVITIS

DR. C. E. WALKER, JR., and DR. HARRY SHANKEL presented a family, consisting of the father, mother, and five children. One of the children, E. B., aged eight years, had been referred to the Eye Clinic at Colorado General Hospital from the Pediatrics Clinic because of a watery discharge from the eyes, redness of the eyes, and photophobia. It was learned that the patient's mother and three other children in the family had the same symptoms. The father and one child were not affected.

The condition was found to be an interpalpebral conjunctivitis with hypertrophy. Smears and cultures were made from the mother and the four children and every one showed the presence of *Streptococcus salivarius*. Mantoux tests and Wassermann tests were all negative.

Smears stained with Wright's stain showed no unusual amount of eosinophils. Skin tests with a vaccine of *Streptococcus salivarius* were negative and inoculations of rabbits gave entirely negative results.

Skin tests for allergic sensitivity were to have been made, but the mother failed to keep her appointment. The mother refuses to allow a biopsy of the hypertrophied tissue.

Discussion. Dr. W. H. Crisp expressed the opinion that this conjunctivitis is due to an allergy. Because of the close relationship between streptococcus and pneumococcus, he recommended the use of optochin with a local anesthetic.

Dr. James W. Lamme believed the poor hygiene of the family to be the underlying cause.

Dr. G. H. Stine recommended a high-vitamin diet and the use of quinine bisulphate locally. He also called attention to the fact that xerosis of the cornea was present in all these cases.

Dr. Sedwick emphasized the fact that the father was the best nourished of the group and that the nutrition of the one child who did not have conjunctivitis was better than that of the other children.

COLOBOMA OF THE RETINA AND CHOROID

DR. C. E. WALKER, JR., and DR. HARRY SHANKEL presented Mrs. E. W., aged 60 years, a patient at Colorado General Hospital, who was referred to the Eye Clinic because of poor vision. Examination revealed 20/60 vision in the right eye. The fundus showed a coloboma of the nasal half of the disc and the adjoining retina and choroid. The vision of the left eye was 20/25, and the fundus was normal. The case was presented for its academic interest only. There was no discussion.

Edna M. Reynolds,
Secretary.

**COLLEGE OF PHYSICIANS OF
PHILADELPHIA****SECTION ON OPHTHALMOLOGY**

December 17, 1936

DR. CHARLES R. HEED, *chairman***ANOMALOUS VENOUS DISTRIBUTION ON
DISC**

DR. M. LUTHER KAUFFMAN presented Miss M. B., aged 21 years, as having an interesting condition for observation. The central retinal vein is formed by two main divisions, a superior one with two branches and an inferior one with three branches. A venous loop comes off at right angles from the superior division at the border of the physiological cup and extends in an arch around the cup toward the temporal side and joins the inferior division at an oblique angle, thus forming what appears to be a venovenous anastomosis.

FAMILIAL DYSTROPHY OF THE CORNEA

DR. ALFRED COWAN said that this family, consisting of a mother and three children (two girls and a boy), all show the following condition in both eyes and almost exactly the same in all four patients.

Throughout the cornea, except for an area around the periphery, there could be seen a number of white lesions of various shapes and sizes, situated superficially for the most part, and extending very often down into the stroma of the cornea. The individual lesions were made up of fine white dots and in many instances several seemed to have coalesced. A few were branched, taking on a certain type of coral formation. Some had a fluffy appearance; others were ringlike. Most of them were opaque, the others being more or less translucent by retroillumination. The an-

terior and posterior surfaces of the cornea were regularly smooth, the epithelium being unaffected. Between the lesions there were scattered a few fine granules, but generally the cornea was clear. The endothelium was unaffected. The rest of the eye was practically normal, except in the case of the mother in which there was an associated immature senile cataract. The patients were healthy otherwise.

The lesions ranged in size up to three millimeters. The visual acuity was normal in each of the four patients except in the mother, in whom it was reduced to 1/60 and 6/30 due to the associated senile cataracts. It is probable that both the number and size of the lesions increased with age. This deduction was made because in the boy, the youngest of the group, the least number and the smallest lesions were found, while the number and size of the lesions were greatest in the mother.

The age of the mother was 53 years and that of the children 27, 18, and 17 years.

The only other one affected in the family, from the history, was the grandmother of the children shown here. Two children of one of the daughters were examined but their corneas were clear.

Discussion. Dr. William Zentmayer said that 10 years ago in association with the late Dr. Calvin Rush he had reported the occurrence of Groenouw's nodular dystrophy of the cornea in four generations, nine members being affected. They agreed in every respect with the cases shown by Dr. Cowan.

Dr. Cowan said that he did not believe that this condition is an affection of the corneal nerves nor that the nerves are any more prominent or numerous than in many other diseases of the cornea. This seems to be the consensus of opinion at the present time.

A CASE OF OCULAR-MUSCLE PALSY ASSOCIATED WITH TOXIC GOITER

DR. C. E. G. SHANNON presented a man, aged 48 years, a milk driver by occupation, admitted to the Jefferson Hospital on April 2, 1936, suffering from toxic goiter. He exhibited tremor of both hands, palpitation of the heart, bulging of both eyes, diplopia, excessive perspiration, and loss of weight. The blood count was normal, the Wassermann and Kahn tests were negative.

A subtotal thyroidectomy was performed successfully by Dr. Bruce Fleming. The specimen was diagnosed by the laboratory as "adenomatous hyperplasia of the thyroid." After the operation, the edema of the lids became less but the diplopia and proptosis obtains at the present time.

At the first examination, December 4, 1936, vision was 6/6 in each eye. Pupils were equal and reacted freely to light, also consensually. Tension was normal in each eye. The media and fundi were negative. Both eyes were proptosed, the exophthalmometer showing 23 mm. on each side. According to Dr. Fleming, the proptosis had not changed since the operation.

The left eye is definitely deviated inwards and downwards. The Maddox rod showed an esophoria of 30 degrees and a left hypophoria of 26 degrees. Diplopia was obtained in all the cardinal directions except in the immediate lower field, that is, about 12 to 14 degrees from the eyes, indicating an involvement of all the extrinsic muscles of the eyeballs. The power of divergence and accommodation was also affected.

Discussion. Dr. William Zentmayer said that as in cases of marked exophthalmos in hyperthyroidism the diplopia is now looked upon by Naffziger, Foster Moore, and others as probably due to

changes in the ocular muscles and not to nuclear or other innervation disturbance, it would seem safer to postpone operative procedures on the muscles until treatment directed to the hyperthyroidism had been given a longer trial. Benedict believes that in most of these cases recovery follows treatment of the thyroid condition.

THE FOUR-MIRRORED HAPLOSCOPE

DR. WALTER I. LILLIE and DR. ROBERT H. PECKHAM said that by paralleling the construction of the early stereoscopes of Wheatstone, Helmholz, and Hering, and by adding a method of telescopic observation of ocular movement, a haploscope has been constructed at Temple Medical School which permits the investigation of squint and heterophoria, and the scrutiny of the theory of corresponding retinal points. The haploscope consists of two arms which rotate about vertical axes passing through the approximate centers of rotation of the patient's eyes. Each arm carries two front-surfaced mirrors which present a doubly reflected image of the stimulus pattern to the patient's eye. It is possible to align the optic axis of the instrument with the visual axis of either of the patient's eyes independently. Attached to these two arms are telescopes of $\times 30$ magnification, permitting observation of eye movements not smaller than one-tenth degree.

The haploscope permits measurement of the angles of squint, of phorias, and of ductions and the study of fixation, binocular fusion, retinal rivalry, and stereopsis. Current investigations give tentative information concerning some of these problems. It has been found necessary to measure the angle of squint both subjectively and objectively for several primary fixations to determine the nature of the malfunction. Following more complete in-

vestigation it is proposed to apply the haploscope to problems of orthoptic training. The study of ocular movements during horizontal ductions has shown that binocular disparity greater than ten degrees can exist without preventing fusion, and that in over half of the 100 cases studied the measure of the prism power overcome is not a measure of the actual change in convergence. The study of cycloduction has revealed the fact that the fusion of simple stereoscopic pictures, when rotated about the visual axes, is not accomplished by correlated ocular movement. It may be accomplished by the fusion of the horizontal and vertical components of binocular disparity.

Discussion. Dr. Alfred Cowan said that Dr. Peckham deserves a great deal of

credit for constructing this instrument which should prove very valuable for research along the lines for which it is meant. A simple type of instrument based on the principles of the Wheatstone stereoscope can be used with great advantage for the diagnosis and treatment of muscle anomalies. As a matter of fact, all the most expensive instruments are based on these principles. With the Brewster type of stereoscope the accommodation is eliminated, but this can be corrected out in a Wheatstone instrument, and there is the added advantage that the object distance can be changed for one or both eyes and that the angle of the carriers corresponds with the angle of the visual lines.

A. G. Fewell,
Clerk.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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EPITHELIAL INVASION OF THE ANTERIOR CHAMBER

The discovery of radioactivity initiated a series of revolutionary changes in our conceptions of matter, physics, and chemistry. As applied to therapeutic purposes, radioactivity has given rise to interesting problems in cellular structure and metabolism.

Not the least interesting of the facts concerning the influence of radioactivity upon living tissue is the remoteness in time of some of the changes produced from the date of application of the radioactive influence. A distressing illustration of this is found in the late effects experienced by some earlier roentgenologists who failed to adopt precautions now generally observed as to unnecessary and excessive exposure to the rays.

It is well known that therapeutic use of radium and X rays around the eye may give rise much later to the formation of cataract. Changes produced in a malignant growth progress over long periods of time.

Tissue cells which have been exposed to radioactivity, and which shortly afterward are studied histologically, may manifest no apparent modification, even under high powers of the microscope. Yet such cells may actually have undergone invisible changes which would have modified radically their future biologic activity. This is exemplified by the effect produced upon the preliminary stages of development of spermatozoa. There is a diminution in sensitivity to radioaction through the various stages from spermatogonia to spermatozoa. Changes arising from radia-

tion in the earlier stages are easily recognized microscopically. Mature spermatozoa, however, fail to show loss of motility or recognizable histologic changes after irradiation. Yet the fact that irradiated spermatozoa have undergone important changes is shown by their becoming infertile, or by the production of abnormal embryos from fertilization of normal ova.

Apparently the more recent and immature the cell structure the more profoundly it is influenced by X ray or radium. Herein lies the secret of the therapeutic effect of irradiation upon rapidly multiplying tumor cells; and hereby are explained many interesting possibilities of benefit in treatment of the sequels of inflammation.

Among the histologically juvenile structures which are particularly susceptible to the influence of irradiation are the new-formed blood vessels which develop during inflammatory processes. It is always proper to think of the X ray as a possible aid in reduction of corneal or other vascularity of a disturbing character after accidental or surgical trauma. Any competent roentgenologist knows how to keep the dosage within entirely safe limits.

One of the most distressing postoperative complications of the cataract operation is epithelial invasion of the anterior chamber by proliferation of epithelial cells carried inward from the surface of the eye. The usual symptomatology of such cases includes delayed healing of the postoperative wound, then a period of apparent quiet, then the onset of iridocyclitis, and finally hypertension.

Federici (*Bollettino d'Oculistica*, 1937, volume 16, page 112) points out that the diagnosis of these cases has been considerably facilitated by the use of the slitlamp. As described by a number of authors (including Salus and Derrick

Vail), the epithelial invasion sometimes begins under the form of a semitransparent film, not always easily recognizable, which descends from the upper iridocorneal angle.

Some have traced histologically a definite connection between the operative wound and the epithelial layer which invades the anterior chamber. The membrane may extend across the anterior capsule or the hyaloid membrane, and it may completely line the iridocorneal angle. Some writers have attributed the formation to definite implantation of corneal epithelium in the anterior chamber, rather than to gradual extension of the external epithelium across the lips of the operative wound. Speciale Cirincione thought it possible for the invading epithelium to line the greater part of the posterior surface of the cornea within the brief period of twenty-four hours.

The prognosis of epithelial invasion of the anterior chamber has been rather generally regarded as hopeless, although some physicians have reported exceptional cases in which they believed arrest of the diseased process was attributable to degeneration and autolysis of the invading epithelium. Excision of the membrane has been attempted, but without benefit.

Apparently the greatest prospect of success is offered by roentgen and radium therapy, particularly the former. An excellent review of the subject was recently published by Vail (*Archives of Ophthalmology*, 1936, volume 15, page 270). In a personal case which he reported, as well as in a number of cases which were summarized in his paper, biomicroscopic study had revealed slow and gradual development of an epithelial membrane on the posterior surface of the cornea and more rapid development on the anterior surface of the iris.

Vail's patient had had an intracapsular

cataract extraction without immediate complications but followed by delayed healing, the anterior chamber remaining open for two weeks. A radium plaque containing 15 mg. of radium was applied for two hours outside the lid over the area involved. The membrane underwent partial absorption, the intraocular tension became normal, and the vision improved considerably.

Federici reports six cases in which X rays were applied, including four of post-operative epithelialization of the anterior chamber and two cases of a more or less analogous nature. The dosage was apparently between one fourth and one third of the skin-erythema dose.

In the first case epithelial invasion was observed five months after a cataract operation whose postoperative course included violent reopening of the wound with iris prolapse. The eye was hypotensive when the patient insisted upon his discharge, but upon his reappearance five months later there was a severe iridocyclitis with hypertension.

In the second case there had been escape of vitreous and delayed healing with iris incarceration, after cataract extraction. Fifty days after the operation sympathetic ophthalmia had developed, but this was overcome with strong doses of urotropin.

In the third case the epithelial invasion was observed a year after cataract operation, in spite of a smooth postoperative course and rapid healing.

In the fourth case epithelial invasion was diagnosed on the twenty-fifth day, and the eye was hypotensive. The fifth case was not one of recognizable epithelialization of the anterior chamber, but capsule was incarcerated in the operative wound. The sixth case was one of traumatic cysts of the iris, which were removed surgically.

One patient with epithelial invasion of

the anterior chamber died before X-ray treatment could be initiated. The X-ray treatment gave favorable results in two of the other three cases of epithelialization, and also in the case of capsular incarceration and the case of iridocyclitis with hypertension following removal of traumatic cysts.

W. H. Crisp.

CONTROLLED READING

In this issue appears an extensive review of a book with this title by Earl A. Taylor. The editor had prepared a review of the same book but had not made such a critical analysis as this one, so substituted the one published on page 844.

The subject of teaching facility in reading has engaged the attention of educators for many years. It has been discussed editorially in these columns. There are several factors of importance in reading, of which the most vital one is comprehension of subject matter; a second is speed; a third is coöordination, with the failure of which are linked various disturbances, such as, general ocular discomfort, nervousness, stammering, and others.

There are several methods of increasing speed of reading and ocular coöordination. "Controlled reading" is primarily a discussion of two instruments; one for recording photographically the movements of the eyes while reading, together and separately, and the other for presenting in sequence one word or phrase at a time across a horizontal line. The word or phrase immediately preceding it, if not at the beginning of a line, is obscured by a shutter at the time the second word is shown, and so on to the end of the line, at which time a new word is shown at the left. These instruments have recently been simplified, condensed, and prepared for general sale.

In attempting to analyze their value to the clinical practice of ophthalmology, it might be said that the diagnostic instrument may add something to our knowledge of the movements of the eye of a patient while reading. This method has been used for some time in the laboratory but never applied extensively to school children, workers of all kinds, or the general run of patients in the oculist's office. A thorough analysis may prove this method valuable as another means of checking the phorias and may even bring out features not picked up by other tests.

There seems no doubt that use of the instrument for training in reading will increase the speed of reading in most individuals. That increasing the speed will not detract from the comprehension has not been proved. That it will help coördination is possible, but there is nothing to show that it is equal in that respect to the use of such instruments as cheiroscopes.

Of greatest interest to the eye physician is whether training of this kind will help the asthenopic patient who has apparently received the maximum of benefit from refraction, orthoptics, and aniseikonic correction. Is it useful in these distressing and puzzling cases for which the ophthalmologist is continually trying to discover some cause for strain that has been previously overlooked? These represent the patients who pass from one physician to another without getting help. They are the ones who are sent to the large ophthalmic centers in consultation because the local oculist has been unable to get satisfactory results. For the past year this examination with the diagnostic instrument has been made for the editor in a moderate number of such patients. Interestingly they have almost invariably shown abnormalities of eye movements; slow reading; too many regressions; too short a word space; frequently poor action of the eyes in carrying from the end

of one line to the beginning of the next. Training usually improved all or most of these features but—and here is the rub—the subjective symptoms remained unchanged.

It must be recalled that these are the most difficult cases; are not primarily reading-difficulty cases; and an insufficient number has been studied from which to draw conclusions: but the preliminary impression of the results with this group has been unfavorable in respect to the relief of asthenopia.

On the other hand, the facility of reading in pure reading-difficulty cases, if the question of comprehension, which has not been sufficiently considered, is eliminated, has seemingly been helped.

Lawrence T. Post.

BOOK NOTICES

CONTROLLED READING. A CORRELATION OF DIAGNOSTIC TEACHING AND CORRECTIVE TECHNIQUES. By Earl A. Taylor, clothbound, 395 pages. Chicago, The University of Chicago Press, 1937. Price \$3.50.

The first 72 pages of the book are occupied with numerous acknowledgments, the Table of Contents, and photographs of those who have done considerable work in the field of reading, with a list of some papers which they have written on this subject. The results, however, obtained by previous investigators are not stated.

The second chapter of four pages describes very briefly the objective methods used in the study of eye movements, dividing them into observations (1) by direct observation, (2) by mechanical and electrical recording, and (3) by photographic methods.

Chapter three of 53 pages is devoted to

a chronological list of apparatus developed for eye-movement photography. Numerous photographs show massive pieces of apparatus which have been previously used for this purpose and which were constructed at a cost of thousands of dollars. It is pointed out that the Ophthalm-O-Graph weighs only 37 pounds; and, although the price is not stated, it is certainly less expensive than the massive pieces of apparatus shown in the photographs. In making this comparison, however, it must be remembered that the earlier pieces of apparatus were research instruments and were not constructed with a view either to portability or low cost.

The principle of operation of the Ophthalm-O-Graph has been used for some time in the photographing of eye movements. A beam of light is reflected from the subject's cornea and falls on a moving film. The incident light beam originates from below the subject's line of vision, and the reflected beam is focused on the moving-picture film which runs vertically and continuously. Thus if the eye is held motionless, the reflected beam will develop a portion of the vertical moving film which corresponds to a straight vertical line. If, however, the eye be moved to the right or to the left, a relatively horizontal line will be traced on the film. If the eye is moved very rapidly, the line will be almost horizontal. A slow movement will cause a relatively oblique line. The reflected beam used is that which corresponds to the first Purkinje image reflected from the anterior surface of the cornea.

Now if the anterior surface of the cornea were a perfect sphere and if the center of this sphere corresponded to the center of rotation of the eye, then any rotation of the eye would produce no displacement of the reflected beam. The fact that the reflected beam does move when

the eye moves is then dependent upon at least two facts, (1) the anterior surface of the cornea is not a perfect sphere and (2) the center of rotation of the eye is not at the same point in space as the center of curvature of the anterior surface of the cornea. The Ophthalm-O-Graph takes a record of the movements of each eye independently but simultaneously and on the same film.

Now it is known that there is no single point which constitutes the center of rotation of the eye. The calculated center of rotation of the eye varies with different positions of the eye. Although a reasonable amount of work has been done on the question of the center of rotation of the eye, the results are not yet conclusive. Probably the best evidence indicates that as the eye moves from left to right, the body centrodome moves on the space centrodome in such a fashion that the movement of the center of rotation of the eye is relatively great for fairly small deviations from straight ahead; and after an extreme deviation has been produced, further movement of the eye causes little further displacement of the center of rotation.

Using the Ophthalm-O-Graph, the incident beam is not thrown on the spherical portion of the anterior surface of the cornea; because in general where the angle Alpha is approximately normal, the spherical portion of the cornea and the utilized portion of the cornea approximately coincide so that if the incident beam from the Ophthlm-O-Graph were thrown onto the spherical portion of the cornea, it would enter the eye through the pupil and the resulting brilliance would be very annoying. Therefore, the incident beam is thrown on the cornea below the portion of the cornea which corresponds to the projected entrance pupil of the eye and on a nonspherical portion of the cornea. It is thought that the general form

of the peripheral surface of the cornea is that of an ellipsoid. It is clear from these considerations that the Ophthalm-O-Graph, unless calibrated for each subject, does not furnish an accurate quantitative guide as to the movements of the eye, and this is admitted in general. However, it does indicate that the eye is moving. If the centers of rotation of the two eyes and the curvatures of the two corneae are sufficiently similar, and if the angle Alpha remains constant, it probably also gives a qualitative measure of convergence and divergence. It is not to be expected, however, to give accurate quantitative estimations of tropias or phorias.

Chapter four, entitled "Types of binocular reading graphs," emphasizes the fact that the Ophthalm-O-Graph records binocular movements. The author states that "It was not until 1933 that the eye specialists began to realize the significance of eye movement photography, and an increasing number are recognizing the fact that a binocular reading graph is an essential part of any comprehensive eye examination." The last phrase is italicized in the text.

In general, it is assumed that the characteristics of a good reader are (1) that he makes few regressions, i.e., he does not move his fixation line back over a portion of the material which it has already traversed, (2) that he uses few fixations or fixation pauses per line, and (3) that the fixation pauses are of short duration. Again, in general, it is assumed that a small number of regressions indicates good comprehension, that few fixations per line indicate that the span of comprehension is good, while short fixation pauses indicate a quick reaction time.

At the end of the chapter is given a table called "Eye movement norms and averages." The norms are the results obtained on subjects who are without formal training in reading with a Metron-O-

Scope, while the averages refer to the same tests applied to a smaller group who had received training on the Metron-O-Scope. The number of fixations per 100 words, the number of regressions per 100 words, and the number of words read per minute are given for various grades in school as also for high school and college. It is shown that for every criterion, namely, fixations, regressions, and words per minute, and in every class, the results for the Metron-O-Scope trained readers are better than the results of the untrained readers. There are no data given concerning the comprehension of these two groups, nor does it appear whether or not the Metron-O-Scope-trained readers read for testing purposes the same material upon which they were trained.

It is apparent from the table that the difference between the trained and the untrained readers becomes less and less as the students become older and older. This may mean that the effect of Metron-O-Scope training on fixations, regressions, and words per minute is less on older students, or it may mean that the poor readers are gradually eliminated as they advance through school and college so that the remaining students are relatively good readers whose reading is less affected by Metron-O-Scope training.

The fifth chapter is entitled "Essentials of a comprehensive reading program." It is stated that "ideal conditions in the school would permit the reading teacher to send her problem cases to a clinic where they would be given a series of mental and reading tests by a trained psychiatrist, and a thorough physical examination. In addition, a complete eye examination would be made by a competent eye specialist. Either the vision or reading examination would include a record of eye movements in the act of reading. . . . Reports of the examinations along with copies of the reading graph would be sent

to the reading teacher who requested the examination. After abnormal physical conditions had been taken care of and the eye defects corrected—either by lenses or eye muscle exercises, or both—the teacher is in a position to direct a vigorous teaching or corrective reading program."

It is also pointed out, however, "it is certain that the same stereotyped procedure cannot take care of all individual differences and it is necessary, therefore, ... to admit of intelligent variation in the use of any of the numerous methods or techniques which may be employed." This indicates that the children are not necessarily to be dealt with in large groups. Therefore, probably several Metron-O-Scopes will eventually be necessary so as to operate them at different rates and with material of different reading difficulties for the various individual children, if the comprehensive reading program outlined is to be carried out.

The sixth chapter is entitled "Special technique in teaching and remedial reading programs and their application." This chapter deals almost entirely with pictures and description of the Metron-O-Scope. It is said that "Briefly described, the Metron-O-Scope is a triple shutter Tachistoscope." Only one shutter is down at a time. Thus only one third of the line of print is exposed at a time. First the left-hand third of the line is exposed, then the first shutter covers up this part of the line while the second shutter exposes the middle portion of the line, etc. An object of this instrument is to prevent regressions since the part which has just been read is immediately covered. Furthermore, by running the apparatus more rapidly, the student can be compelled to speed up his reading. Further, the apparatus tends to promote three fixations per line. It is, however, admitted that "the majority of subjects cannot . . . be taught

to read a line of print with just three fixations." So that the Metron-O-Scope attempts to train the children to do something which it is admitted the majority of them cannot do in actual reading. The question of whether or not it is advisable to eliminate regressions will be discussed later as will also the advisability of speeding up the reading rate. It may also be noticed here that large Metron-O-Scopes are operated at a distance. Under these conditions, the eye movements necessary to reading are practically pure conjugate deviation unaccompanied by either convergence or accommodation. In the actual reading of a book, however, a change of convergence and accommodation would be necessary for perfect vision at different points on a line. Vertical movements of the eyes are also necessary in reading, whereas the Metron-O-Scope compels the child to read without vertical eye movements.

Under favorable conditions, these changes of convergence and accommodation are not large; but they are nevertheless significant. The difference in accommodation necessary between the end of the line and the middle is about one quarter of a diopter, while the convergence must be changed about one degree, or two prism diopters. If the conditions are made less perfect, as when the book is held closer to the eyes and is a larger book, the differences of accommodation and convergence necessary are much larger. A difference of one degree, although apparently small, is by no means insignificant, since it exceeds the visual-acuity threshold by at least 6000 percent; and if the convergence is not appropriately altered from the ends of the line of print to the middle, either total replacement or diplopia would probably result.

Chapter seven is entitled "Physiological defects and eye discomfort among school children", and it presents the first

experimental material. The first experiment consisted of a comparison of data on two groups of children, normals and failures. The normal group consisted of 387 high-school pupils taken from four mathematics classes, while the group of failures consisted of 100 pupils from the same school who had failed 3, 4, or 5 courses during the preceding semester. The data gathered concerned the number of fixations per 100 words, the number of regressions per 100 words, the comprehension, the speed in words per minute, the minutes spent in study, near phoria, stereopsis, and reading ratio. The conclusion drawn by the author is that "the findings in this study . . . indicate the importance of studying eye discomfort and its causes in every comprehensive reading program."

The percentage difference between the normals and the failures is not calculated by the author. A simple analysis, however, shows that the greatest difference between the normals and the failures occurs under the heading, "Minutes spent in study," where it can be seen that those passing spend 16 percent more time studying than do those who fail. This factor is at least not directly connected with inability to read well. The second most significant difference between the passing and the failing students is found under the heading, "Comprehension." Here we find that the comprehension of the normals is ranked 14 percent higher than that of the failures. The third largest difference between the normals and the failures comes under the heading "Stereopsis." Here it is found, interestingly enough, that the failures have 9 percent better stereopsis on the average than the normal students. It thus appears that the passing students get better marks despite the fact that their stereopsis is not so good as that of the failing students. So far, of the three largest per-

centage differences between the two groups, two—the minutes spent in study, and the ability to comprehend—might be thought to be relatively independent of ocular movements; while the third, stereopsis, which is concerned with vision, shows an advantage in favor of the failures. The fourth greatest difference is in the number of regressions per 100 words. Here it is found that the normals regress 9 percent less than do the failures. It is not at once apparent, however, that this may not be due to the necessity on the part of the failing students to regress and read back over a portion of the material which they have not comprehended on the first reading. The next difference is in the number of fixations per 100 words. Here the normals use 8 percent fewer fixations than do the failures. The normals have 6 percent higher reading ratios as tested by the amount of base-out prism which can be tolerated during the reading than have the failures. The normals also have 2 percent higher reading ratios as tested by base-in prisms than have the failures. Despite these differences, however, which are in favor of the normals, the fact that the failures have a still greater advantage over the normals in stereopsis tends to indicate that the duction power of the failures is quite adequate for most purposes. Here it would be interesting to know at what distance and under what conditions stereopsis was tested. The fact that the average duction power of the failures, as measured by base-out prisms while reading, is almost 6 times the average near phoria indicates that the group's duction power is ample to overcome its near phoria.

Finally we come to the least differences between the two groups. These consist, respectively, of speed in words per minute and near phoria. These factors, which from the point of view of the book might be considered most important, show the

least differences between the two groups.

If we consider the tests with which the greatest differences are found, namely, minutes spent in study and comprehension, it appears that the normals spend 16 percent more time studying than do the failures; and, furthermore, they get more out of the time they do use in study because their comprehension is 14 percent greater than is that of the failures. It is, of course, realized that one may not with assurance multiply minutes of study by comprehension and get very reliable results. Nevertheless, as a first approximation we may express the total amount learned by a student on a given day as the number of minutes spent in study multiplied by the efficiency of that study as measured by the comprehension. Doing this, we find that the advantage accruing to the normals over the failures due to the fact that they study more and also study more effectively when they do study is almost 32 percent or one third. We may roughly say that the normals learn one third again as much per day as do the failures. The question now arises as to whether this difference is not in and of itself sufficient to account for most of the differences between failing and passing without having recourse to explanations based on the lesser differences found in testing the two groups with respect to their reading capacity. The fact that the difference in speed of reading between the two groups is less than 2 percent indicates that the failures are probably not bored by their inability to read rapidly. The fact that their near phoria is only about 0.2 of 1 percent greater than that of the normals, in turn would seem to indicate that, in general, they are not exhausting themselves by doing the lesser amount of studying which they do. It may be possible to give data which show that, in general, failure in school is attributable to poor reading, muscular im-

balance, and so forth; but in all fairness, it must be noted that the data given in the chapter just discussed offer little or no evidence in that direction.

The eighth chapter is called "Visual inefficiency as related to failure in mathematics." The author points out that the percentage of failures in mathematics is higher than it is in any other subject. It has been suggested that the reason for this is that only a certain percentage of the population has the mental capacity to do well in mathematics. The author believes that "this argument cannot be sustained, because the conditions found on the lower levels of instruction prevail in college also, and the mentally retarded usually are eliminated from the school population before they reach the college level." It must be remembered that in college the students are given more difficult mathematics; so that even though the mentally retarded have been eliminated, there still remain some who have not the mental capacity to do the more advanced mathematics required of them. The author points out that as far as mathematics is concerned, the percentage of failure among high-school students and college freshmen is about the same. He says "this seems to indicate that the causes underlying failure exist before the students reach high school as a similar condition exists in the junior high school, and yet it is not the fault of the elementary school teacher." Of course, the categorical statement that "it is not the fault of the elementary school teacher" has been denied; but aside from this, there may be some real question as to whether the fundamental difficulty did not develop before elementary school rather than in it, since it is the consensus of opinion that the individual's I.Q. is essentially constant. The author points out that reading material containing mathematical symbols and formulas requires more fixations per

line of print and more careful eye movements than any other type of reading. Here, of course, it would be of interest to know how many of the high-school students experimented on were taking geometry and how many were taking algebra and arithmetic—the main courses in mathematics given in high school.

Experimental data are then presented. The author says, "An examination of the following data will show that there is a foundation for the belief that visual inefficiency influences the success of the student in mathematics."

The data were collected by means of the Otis Self-Administering Test of Mental Ability and the Ophthalm-O-Graph was used to measure the number of fixations, regressions, and the time for reading. The subjects were tested for their comprehension of what they had read on cards during the tests with the Ophthalm-O-Graph. The author says, "In every item studied, the normals surpassed the failures. In comprehension, however, it was found that the failures were almost as effective as the normals in reading the nontechnical selections on the camera cards. These data would seem to indicate that a great deal of the difficulty experienced by failures in mathematics can be traced to the lack of mechanical skill in reading." The fact that, although the I.Q. of the normal group is about 107 and that of the failure group 92 while the comprehension test shows the failures to be almost as good as the normals, probably indicates only that the cards are an inadequate test of the I.Q. As to the rest of the items, the question arises as to whether the students fail because they make a large number of regressions, fixations, and read slowly, or whether they make a large number of regressions, fixations, and read slowly because they cannot comprehend more rapidly.

In college mathematics particularly, it seems hard to believe that it is lack of

accuracy of eye movements which compels some students to spend an hour or so on one page of the text.

Chapter nine is entitled "A preliminary study of Metron-O-Scope reading." Four subjects, all college sophomores, were tested before and after training with the Metron-O-Scope. Metron-O-Scope training of each of these four produced a decrease in the number of fixations, number of regressions, and time, and increased the average rate of words per minute. In some instances, the change was negligible; in others, it was considerable. The only column for which the percentage is not calculated is that of comprehension. Here we find that the comprehension of two of the subjects was decreased while the comprehension of the other two was increased. The subjects were also tested six months after the end of the training period, and the conclusion of the author is that this test "indicates that in terms of increased functional efficiency, the improvement is relatively permanent." The number of fixations was decreased almost 15 percent, and about 44 percent of this improvement was maintained so that the final improvement is about 6½ percent. The time for reading was cut down 17½ percent, and about one half of this improvement was maintained bringing about 8½ percent final improvement. The most striking improvement occurs in the elimination of regressions. There were almost 52 percent fewer regressions, and 82 percent of this improvement was maintained, so that the final improvement was about 42½ percent.

Percentages under the heading of comprehension are not given by the author—there being substituted instead in this column the number of practice periods attended. All four subjects show loss in comprehension, the amount varying from 10 percent to over 36 percent and being greater than necessary to counterbalance the shortened time of reading. If the im-

provement in time of reading is about 8½ percent while the loss of comprehension is 16½ percent, it seems that the training produces a net loss in comprehension. It is suggested by the author, however, that the loss in comprehension is only apparent since a more difficult test of comprehension was used at the end of six months. To evaluate definitely the results, then, it would be necessary to know the difficulty of the second test with respect to the first. It is, however, significant that one half of the subjects showed a loss of comprehension even when tested immediately after training, where it is not claimed that the test after training was more difficult than the test before training.

At this point we may bring up the question whether the simple comprehension tests used on these four college sophomores are adequate. They require answers to the following four questions: (1) Did Aladdin spend most of his time at work? (2) Was the boy yet 18 years old? (3) Was Aladdin watched closely by an American? and (4) Did Aladdin spend most of his play time with working boys? The uniformly high comprehension scores achieved before Metron-O-Scope training was initiated indicate that the questions used were not such as to tax the powers of comprehension of the normal sophomore in college. We might expect the comprehension to hold up at least fairly well even under handicaps, if there were, so to speak, reserve ability to comprehend which had not been called into play during the first test. It seems likely that if more difficult material had been used instead of the story of Aladdin so that the subjects were utilizing their powers of comprehension nearly to the limit in the first instance, then the increase in speed might have brought about a more decided drop in comprehension.

Chapter ten is called "Diagnosis and

correction of reading deficiencies in high school." This concerns an experiment in which the subjects were divided into two groups of 25 students each. The students were from the tenth and eleventh grades in high school. The author says that the "two groups were arranged so that they had almost (a) the same average grades in 4½ months of school, (b) the same average I.Q. on the basis of the Otis Self-Administering Test of Mental Ability, and (c) the same standing on the Iowa Silent Reading Test. The reading ability of the students as indicated by the number of fixations and regressions shown in the preliminary reading-graphs, was also taken into consideration in the grouping." One of these groups was selected as the experimental group and was given training on the Metron-O-Scope; the other group was taken as the control group, and their training consisted of reading from mimeographed sheets after they had received verbal instructions to make "an effort to read with not more than three fixations to a line of print and with no regressive movements."

Examination of table eleven shows that the experimental group which was to receive training on the Metron-O-Scope had fewer fixations, fewer regressions, and read more rapidly than the control group before the experiment started. At the end of the training period, "the eye movements were again photographed and the subjects were given the same type of tests as had been used for the test for grouping before the experiment began." The author says that "table 12 is a comparison of the data obtained at this time"; that is, a comparison of the data obtained at the end of the training period. This, however, is not what we are interested in. What we wish to know is the amount of improvement which was brought about by the two different methods of training. We are not interested in table 12, which shows that the experimental group has

fewer fixations, fewer regressions, and a more rapid reading rate than the control group; because, after all, these facts were observable before the training began.

Let us, therefore, use table 13 and notice the amount of change before and after training for the two groups. First, however, we note that after training, the I.Q. of both groups went up. The author says of this, "the apparent gain in I.Q. which is shown in both groups, indicates that the group test used is influenced by reading ability and reaction time and is not valid, therefore, solely as a test of mental ability." Examination of table 13 shows that the apparent I.Q. in the control group increased more than did that of the experimental group. This indicates that reading from the mimeographed sheets increased the apparent I.Q. more than did the reading from the Metron-O-Scope. If this increase is due, as the author states, to reading ability and reaction time, then we may conclude that the reading ability of those who read from mimeographed sheets was increased more than the reading ability of those who read from the Metron-O-Scope. The average results of the tests which were devised to test reading ability also show a greater improvement in score for the control group than for the experimental group. The control group also shows greater improvement with respect to speed of reading than does the experimental group. Despite the fact, however, that the control group shows a greater improvement in I.Q. and a greater improvement in reading ability, as is shown by reading-ability tests, they, nevertheless, show less improvement in the number of fixations and in the number of regressions. This indicates apparently that the number of fixations and regressions is not too intimately connected with reading ability as defined in other ways.

The two groups were tested a month

later to determine the permanency of the results. For this subsequent test, data on the I.Q. and reading tests are not presented. The author points out that the experimental group is superior to the control group in number of fixations, number of regressions, comprehension, and time. Indeed, as we have seen, this was the state of affairs immediately after training and even before training. In terms of retention of improvement, the control group is superior with respect to time and fixations.

The next two chapters are devoted to duction and fusional training in reading as also to prism reading with the Metron-O-Scope. These chapters bring up the question of orthoptic training. This constitutes a considerable problem in and of itself; some authors denying, others accepting to varying extents the efficacy of orthoptic training. The author advocates orthoptic training strongly, particularly when it is used in conjunction with the Metron-O-Scope. There is not sufficient time to discuss this question here.

The author shows by means of an experiment on 25 subjects that prism-reading training decreases the number of fixations and regressions and increases the number of words read per minute. That Metron-O-Scope training would accomplish this, however, was with the possible exception of increasing the speed of reading, admitted from the start. The questions are: (1) Do we wish to decrease the number of fixations and regressions and increase the speed of reading? (2) Do we wish to attempt this with all subjects? (3) Can we improve reading ability more by other methods than we can with the Metron-O-Scope, such as by verbal instruction or by putting fixation dots on a page of printed material? As to these questions little evidence is presented.

The data in table 19 record the results obtained by applying the Ophthalm-O-

Graph to 231 office workers and recording the number of fixations, regressions, and words per minute. The subjects were divided into 4 groups: group one, auditors and bookkeepers; group two, stenographers and typists; group three, executives and department heads; and group four, clerks. The results show that the executives and department heads use the greatest number of fixations, they make the greatest number of regressions, and they read the fewest number of words per minute of any group. The stenographers and typists, however, use the fewest number of fixations, they make the least number of regressions, and they read more words per minute than any other group.

The tendency of the Metron-O-Scope, as has been shown by the author, is to decrease the number of fixations and regressions and to increase the speed of reading. That the Metron-O-Scope tends to do this was admitted from the start by the reviewer. It thus appears that the Metron-O-Scope tends to produce the reading characteristics of a stenographer or a typist and that it inhibits the reading characteristics of an executive or a department head.

In the absence of any showing as to the relative comprehension exercised by these two groups, we may remain in doubt as to the advisability of Metron-O-Scope training for all.

In conclusion, the relationship between reading ability and movements of the eyes is not so clear as might be desired. Thus it may appear remarkable that an individual with marked nystagmus can read at all. On the other hand, it appears that the fixation tremor of the eye is actually beneficial for visual acuity.

On page 115 are four very interesting graphs of the eye movements of an 8-year-old boy who was in the first year of high school but was carrying second-year mathematics. The author states that, "His

eye movements have been photographed 13 different times, and all of the records are somewhat similar to those shown above. He reads backward as well as forward, evidencing few of the characteristics usually associated with the reading process. The rate of reading has varied from 646.15 words per minute to 2202.53 words per minute." The latter figure is over five times as great as that of college students who have been Metron-O-Scope trained. This 8-year-old boy has read 1987.7 words per minute with excellent comprehension. The question at once arises as to whether it might not be better to attempt to train the students to read in the fashion in which this boy does. It is, however, possible that such training could not take place because of some anatomical peculiarity. The author says of this boy, "He evidently has an unusually large macular area which enables him to read with what has been termed a 'photographic' eye." Aside from the *a priori* improbability of a large macular area existing, it does not appear why, if he has a large macular area, he has to move his eyes laterally so much. This boy must, of course, have a large number of regressions since he reads backward as well as forward.

For a fairly rigorous scientific proof of how we wish to attempt to train students to read, one would think that the following steps would be necessary: first, examine a large group of individuals not with respect to fixations or regressions but merely to find out how rapidly they read reasonably difficult material and what their comprehension of it is. There should now be some point of balance for any individual at which he reads at a reasonably rapid rate of speed and still comprehends well. We could then select as the best readers those whose comprehension per unit of time is highest; that is, those who comprehend the greatest amount of

material in two minutes, or 5 minutes, or 10 minutes regardless of the number of fixations, regressions, or the rate of reading. These we may define as good readers.

Now as the second step, we may analyze the characteristics of these good readers. Suppose we find that executive and department heads read with the greatest amount of comprehension per unit time; that is, if given 2 minutes or 5 minutes, the total amount which they comprehend is the greatest. *A priori*, this is what one would expect of this group. Examination of their eye movements shows that the number of fixations and regressions is relatively large, and their rate of reading relatively slow. This, then, might be considered characteristic of good readers. This does not say that there may not be other types of good readers; for example, the 8-year-old boy who far exceeds all others mentioned and who reads both backward and forward. This, then, may be a characteristic of good reading.

As the third step, we should have some means of diagnosing what constitutes serious deviations from good reading so that we do not attempt to train all alike. Fourth, we may attempt to find some means of improving reading ability. We should then devise, if possible, a method of instruction or an apparatus which will tend to promote the eye movements desired, whatever they may be; although here a serious question arises as to whether the movements would not automatically take on the desired characteristics if there could be developed in the student a general attitude toward word and sentence grouping and thought grouping that the good readers may possess.

As I see it, the book "Controlled reading" fails to offer evidence (1) as to what constitutes good reading, but starts with the assumption that good reading consists of few fixations and regressions

combined with high speed. (2) It is shown that Metron-O-Scope training will decrease the number of fixations and regressions. (3) It seems to do this at the expense of comprehension, as might appear more clearly if more adequate tests of comprehension were used. (4) It offers some evidence that reading ability as measured by tests of reading ability and an increase of I.Q. can be brought about more effectively by other means than the Metron-O-Scope. And (5) It also offers some evidence that the Metron-O-Scope trains the student in the direction of the stenographers' and away from the executives' type of reading.

Elek John Ludvigh.*

TRANSACTIONS, SECTION ON
OPHTHALMOLOGY, AMERICAN
MEDICAL ASSOCIATION, 1936.
332 pages. Illustrated.

For practical value to American ophthalmologists these transactions probably give more for the money than any other book published within the year. In this volume the chairman's address, by Dr. John Green, is headed "The promotion of blindness," and discusses some of the most important contributing factors. The young ophthalmologist is impressed with the large proportion of cases in which blindness might have been prevented. From some of the causes, as ophthalmia neonatorum, industrial injuries, and Fourth of July explosions, the number of cases has been greatly reduced. But it still remains that cases of this kind occur, and will do so until the more general appreciation of their danger is created in the general profession and among the laity. Factors in childhood remain important because children and

* From the Howe Laboratory of Ophthalmology, Boston, Mass.

parents, and sometimes medical advisers, do not recognize the danger. The optometrist, with his advertising and salesmanship, is still effective in the promotion of blindness. Enough cases, from lack of recognition and early effective treatment, remain to remind us that much is still to be done to perfect ophthalmic practice.

A statistical study of "Muscle tests in myopia," by Dr. A. C. Snell, throws new light on the relation of axial myopia to esophoria. Apparently convergence insufficiency does not characterize all cases of myopia and figures as an effect rather than a cause. "A study of causes of blindness in Pennsylvania," by Dr. Alfred Cowan and S. M. Sinclair, bring to us valuable statistics, which are much needed. "Iridectomy with cyclodialysis," by John M. Wheeler, seems to show that in seemingly hopeless cases of glaucoma the two operations conjoin to give more grounds for hope in apparently desperate cases.

"An embryologic interpretation of malformations of the posterior segment of the eye," by Dr. Bertha Klien, brings together facts and conclusions that will be valuable for reference. The twenty other papers, not here mentioned by name, that are contained in this volume all furnish points of interest and practical importance. The illustrations help to make clear the papers in which they are used. Two of them give to the readers pictures of the scientific research medal and the Knapp medal that are, from time to time, awarded by this Section. The list of Fellows belonging to the Section for the last five years gives a convenient directory of ophthalmologists to whom one may refer a patient.

Edward Jackson.

CATARACT, ITS PREVENTIVE AND MEDICAL TREATMENT.

By A. Edward Davis, A.M., M.D.
Cloth bound, 181 pages. Philadelphia,
F. A. Davis Co., 1937.

It is now fifteen years since Dr. Davis presented at the International Congress of Ophthalmology, in Washington, his first paper on "Serum and vaccine treatment for the prevention and cure of cataract." Since then he has published a series of papers on what he calls the "antigen treatment of cataract." It is natural and right that at this time he should publish in one volume a summary of his views on this subject, the arguments supporting them, and the results of his experience in this line of treatment.

The headings of the twelve chapters into which the book is divided are: Historical, Etiology, Diagnosis, Symptoms, Pathogenesis, Spectroscopy, Treatment, Dietary treatment, Errors in refraction, Other methods of non-operative treatment, Case records, and Experience of other observers with favorable and unfavorable reports. The chapter on spectroscopy is by S. Judd Lewis, D.Sc., and the one on errors in refraction by J. Burdon Cooper, of Bath, England. There is also a foreword by F. Park Lewis, of Buffalo, N.Y. The last chapter cites a dozen reports, including those of Drs. Conrad Berens, Kirby and Giles of New York, E. C. Ellett of Memphis, Allen C. Woods of Baltimore, and the Drs. Green of San Francisco. In his comments, Dr. Davis states: "My results are better than when I first began the use of the remedy." "This percentage (81.47) of retained useful vision is only a little less than that following cataract extraction."

Edward Jackson.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

1

GENERAL METHODS OF DIAGNOSIS

Allen, T. D. **Simple cone for tangent screen.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1936, 87th session, p. 268.

A cone, perforated at its apex, and held in a trial frame, allows macular fixation with the sound eye in mapping out the central field of an amblyopic eye. (3 illustrations.)

George H. Stine.

Bedell, A. J. **The clinical importance of pigment in the fundus.** Trans. Amer. Acad. Ophth. and Otolaryng., 1936, 41st meeting, p. 446.

The author describes the various forms of pigmentation of the fundus, and concludes that they are distinctive and, when considered as one element in diagnosis, of supreme clinical importance. (Discussion.)

George H. Stine.

Hartmann, M. E. **The X ray in ophthalmology. A clinical atlas.** Bull. Soc. Franç. d'Ophth., 1936, v. 49, pp. 3-18.

(See review, Amer. Jour. Ophth., 1936, v. 19, p. 809.) A report to the Society on this publication is followed by discussion of the subject.

Lijo Pavia, J. **Infrared photography. Its application to ophthalmology.** Tra-

balhos do Primeiro Congresso Brasileiro de Ophth., 1936, v. 1, pp. 53-55.

The author reports some cases in which photographs of the fundus were taken with both panchromatic and infrared plates. The importance of infrared photography of the eyeground for detecting details which are not shown in photographs taken with panchromatic plates is emphasized.

Ramon Castroviejo.

Lijo Pavia, J. **Slitlamp. Photographs of its image in the living human eye.** Trabalhos do Primeiro Congresso Brasileiro de Ophth., 1936, v. 1, pp. 49-52.

Using a slitlamp equipped with an arc lamp, the author has been able to photograph the section produced by a narrow beam of light from the slitlamp going through the cornea, anterior chamber, and lens. A few cases are briefly described.

Ramon Castroviejo.

Lindner, K. **Deflected microscope for examination of vitreous and ocular fundus in the light-beam of the slit-lamp.** Deutsche Ophth. Gesell., 1936 (reprint).

The author uses a plane contact glass 15 mm. in diameter, a monocular prism-microscope, and a slitlamp lens much narrower and of shorter focus than usual. Fixation by the patient is se-

cured through a window in the instrument. With the direct-current arc lamp, beautiful pictures of the fundus are obtained in redfree light, and the apparatus is an "indispensable help" in cases of vitreous detachment.

W. H. Crisp.

Martínez Hinojosa, F. Photography of the ocular fundus. Anales Soc. Mexicana de Oft. y Oto-Rino-Laring., 1936, Oct.-Dec., pp. 99-112.

The history of photography of the ocular fundus is reviewed, with special credit to Daniel M. Velez for introducing and popularizing the procedure in Mexico.

W. H. Crisp.

Mayer, Leo. Neon flash illuminated perimeter. Trans. Sec. on Ophth., Amer. Med. Assoc., 1936, 87th session, p. 270.

A neon bulb in its housing attached to the arm of the Schweigger perimeter furnishes a minimal light flash in place of the ordinary test objects. Hysterical fields have not been found with this instrument. (2 figures.)

George H. Stine.

Sukonzikova, A. A. Diagnosis of ocular tuberculosis and treatment with Kressling's tuberculin. Sovetskii Viestnik Opht., 1936, v. 9, pt. 4, p. 464.

An analysis of 810 cases treated at the Leningrad Ophthalmologic Institute during 1930-1935. The Kressling tuberculin is a two-year culture containing products not only of live tubercle bacilli but also of their disintegration. The conclusions are that a positive Mantoux reaction is an indication for tuberculin therapy. The results were excellent in uveitis, sixty percent of the cases of choroiditis recovering with good vision.

Ray K. Daily.

Vishnevski, H. A. Light sensitivity in the various diseases of the uvea, retina, and optic nerve. Sovetskii Viestnik Opht., 1937, v. 9, pt. 3, p. 267, and pt. 4, p. 410.

The detailed report of this exhaustive study leads to the following conclusions: The determination of light sen-

sitivity is of diagnostic value. Fixation in the dark is performed not by the macula but by a paracentral area. Binocular light sensitivity is higher than monocular. The study of light sensitivity confirms the presence of two apparent systems of visual perception—the rods and cones. This study gives no indication on the reciprocal relation of the center with the periphery of the retina. Protective spectacles raise central and peripheral sensitivity. Nyctalopia is characterized equality of central and peripheral sensitivity. The rods and cones of one eye influence the sensitivity of the other eye. The effect of light adaptation of one eye on the sensitivity of the other eye depends on the photoreceptors, conduction paths, and visual centers. The processes of dark adaptation of one eye affect the other eye. Red light of 650 millimicrons has a stimulating effect on the cones. Auditory stimulation lowers peripheral and increases central vision. The test for dark adaptation may serve to evaluate the effect of therapeutic procedures.

Ray K. Daily.

2

THERAPEUTICS AND OPERATIONS

Awerbach, M. Note on expulsive hemorrhage. Ann. d'Ocul., 1937, v. 174, Jan., pp. 44-49. (See Amer. Jour. Ophth., 1936, v. 19, Oct., p. 947.)

Barkan, O., and Maisler, S. Adrenalin chloride 1:100 in ophthalmology. Amer. Jour. Ophth., 1937, v. 20, May, pp. 504-507.

Bietti, Giambattista. The utility of marconitherapy (short waves) in some ocular affections. Boll. d'Ocul., 1936, v. 15, Dec., pp. 1261-1274.

In 118 cases of various ocular affections the writer used an apparatus giving waves of 6 meters. Good results were had in supraorbital neuralgia, superficial ulcer of the cornea, traumatic anterior uveitis, spasm of the central artery, and some other conditions. The indications for short-wave therapy are analogous to those for diathermy, but it is more easily applied, burns are

rarer, and direct contact with the electrodes is avoided, making it available where diathermy is not. (Bibliography.) M. Lombardo.

Hartmann, M. E. **The X ray in ophthalmology. A clinical atlas.** Bull. Soc. Franç. d'Opht., 1936, v. 49, pp. 3-18. (See Section 1, General methods of diagnosis.)

Rindello, Salvatore. **Researches on lysozyme in relation to some questions concerning ophthalmology.** Boll. d'Ocul., 1936, v. 15, Nov., pp. 1215-1231.

The lytic power of lysozyme affects in a strong concentration staphylococci, streptococci, and the xerosis bacillus, but has no effect on the diphtheria bacillus, the pneumococcus, or the anthrax bacillus. In xerosis of conjunctiva and cornea the lysozyme has lost much of its power, and this explains in part the progress of the disease in such cases. Therapeutic attempts by instillation of lysozyme in the conjunctival sacs of patients affected by incipient xerophthalmia connected with trachoma have given negative results. (Bibliography.) M. Lombardo.

Sukonzikova, A. A. **Diagnosis of ocular tuberculosis and treatment with Kressling's tuberculin.** Sovietskii Viestnik Opht., 1936, v. 9, pt. 4, p. 464. (See Section 1, General methods of diagnosis.)

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Alvaro, M. E. **Application of contact glasses.** Trabalhos do Primeiro Congresso Brasileiro de Opht., 1936, v. 1, pp. 41-44.

The author reports his experience in the use of contact glasses.

Ramon Castroviejo.

Bossalino, G. **Clinical statistical considerations on the visual acuity of myopes.** Arch. di Ottal., 1936, v. 43, March, p. 73.

For 3,063 eyes affected by simple myopia and compound myopic astigmatism, the author gives statistical data drawn from considerations of visual

acuity without correction and after correction. Resulting statistics are also given on the varying corrigibility of simple myopia and compound myopic astigmatism. H. D. Scarney.

Bruce, G. M. **Contact glasses.** Amer. Jour. Opht., 1937, v. 20, June, pp. 605-617.

Dekking, H. M. **The influence of long-wave light on retinal function.** Graefe's Arch., 1937, v. 137, pt. 1, p. 153.

The sensibility of the dark-adapted retina is diminished in red light. The threshold for a minimal stimulus is thereby elevated. This elevation of the threshold is closely associated with the foveal region or with the cones. The effect occurs only in wave lengths over about 6,200 Å.E. Information on the activity of pure infrared light has not as yet been obtained. The phenomenon is most evident in minimal intensities and always diminishes with increasing strength of the light, to finally disappear completely. The elevation of the threshold appears to be about the same for all colors. H. D. Lamb.

Fincham, E. F. **The mechanism of accommodation.** Brit. Jour. Opht., monograph supplement 8, 1937, 80 pages.

The author has gathered into this monograph his works on the subject as published during the past twelve years. In the introduction it is stated that the purpose of the work is to probe the physical agencies affecting the refractive power of the eye in accommodation. The following headings are used: History and theories, The anatomy and physical character of the parts concerned, The changes in the form of the crystalline lens in accommodation, Evidences of change of tension in the suspension of the lens, The influence of tension upon the form of the lens, The influence of the capsule upon the form of the lens in accommodation, Summary of the evidence, General statement of the mechanism of accommodation, The cause of the reduction of the amplitude of accommodation with age.

(41 text references, extensive bibliography, photographs, figures, tables.)
D. F. Harbridge.

Fincham, E. F. **An experiment on the influence of tension upon the form of the crystalline lens.** Trans. Ophth. Soc. United Kingdom, 1936, v. 56, p. 138.

The author studied the curvature of the anterior-lens surface of a prepared young eye before and after the zonular fibers were cut. He concludes that the ultimate forces which changed the form of the lens, although set in operation by the contracting ciliary muscle, must reside in the lens substance and the capsule. The lens capsule as an elastic membrane, when freed from the tension of the zonule, can influence the form of the plastic lens substance by pressure.
Beulah Cushman.

Frank, Helene. "Word blindness" in school children: the predominant causal role of delayed development of perceptual functions. Trans. Ophth. Soc. United Kingdom, 1936, v. 56, p. 231.

After prolonged study into the difficulties experienced by apparently normal children in learning to read, the author concluded that delayed development of the perceptual functions was responsible. Mistakes seemed to be caused by a relatively immature stage of perception as to shape and position in space.
Beulah Cushman.

Hardy, Guerdan. **Aniseikonia.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 599-604.

Kraupa, E. L. **Epithelioma from defective spectacle bridge.** Zeit. f. Augenh., 1937, v. 91, Feb., p. 185.

A small lesion under badly cutting spectacle bridge in a man of 42 years proved, on histologic study, to be an epithelioma.
F. Herbert Haessler.

Luckiesh, M., and Moss, F. K. **The avoidance of dynamic accommodation through the use of a brightness-contrast threshold.** Amer. Jour. Ophth., 1937, v. 20, May, pp. 469-478.

Pickard, Ransom. **The light threshold at the macular and perimacular**

region. Trans. Ophth. Soc. United Kingdom, 1936, v. 56, p. 219.

An investigation as to central light perception and field perception up to twelve degrees from the fixation point is reported. The tests were carried out in a dark room under full dark adaptation. (Graphs as to central dark adaptation and fields, and sectional graphs of light perception along the horizontal meridian.)
Beulah Cushman.

Rezende, Cyro, and Zegottis, A. **Theories of contact glasses.** Trabalhos do Primeiro Congresso Brasileiro de Ophth., 1936, v. 1, pp. 45-48.

The authors discuss briefly the optical values of contact glasses.
Ramon Castroviejo.

Rhodes, D. H. **An adaptation of Guthrie's physiological lensless spectacles.** Amer. Jour. Ophth., 1937, v. 20, May, pp. 517-518.

Roelofs, C. O. **Binocular and monocular localization.** Arch. f. Augenh., 1937, v. 110, March, p. 330.

Optic localization differs only slightly in monocular and binocular vision although the innervation mechanism differs. One may assume, therefore, that optic localization depends mainly upon innervation impulses received by the fixing eye. The author further emphasizes the great part light stimuli play in optic localization.

R. Grunfeld.

4

OCULAR MOVEMENTS

Bielschowsky, A. **Application of the after-image test in the investigation of squint.** Arch. of Ophth., 1937, v. 17, March, pp. 408-419.

Detection of anomalous retinal correspondence by means of a glowing filament exposed to one eye in a vertical position and to the other in a horizontal position is described. The importance of determining whether retinal correspondence is normal or anomalous before correction of squint is attempted is discussed and five illustrative cases are presented in detail.

J. Hewitt Judd.

Bielschowsky, A. The etiology of squint. Amer. Jour. Ophth., 1937, v. 20, May, pp. 478-489.

Ford, F. F., and Walsh, F. B. Clinical observations upon the importance of the vestibular reflexes in ocular movements. Bull. Johns Hopkins Hosp., 1936, v. 58, Feb., p. 80.

The authors report four cases, the first of which showed complete loss of all volitional movements of the eyes due to a supranuclear lesion. The eyes could be freely moved by passive movements of the head during ocular fixation. The second case showed a severe left hemiplegia associated with loss of left lateral gaze. The third and fourth cases, in which section of both vestibular nerves was done, showed abolition of the vestibulo-ocular reflex.

Theodore M. Shapira.

Hermans, R. The therapeutics of diphtheric ocular paralysis. Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 69.

The therapeutic value of narcosis in tetanus is recognized by clinicians. The author gives brief reports of three cases of stubborn, postdiphtheric paralysis treated by narcosis with ethyl chloride, apparently with good results. He concludes that one is not justified in using this treatment systematically in all cases of diphtheric paralysis but mainly in the more rebellious cases of paralysis of the extrinsic ocular muscles. If in these latter cases a cure is not otherwise obtained within two months one may try narcosis. In one patient, a child of nine years, deep ether narcosis lasting ten minutes gave no result, but two days later deep ethyl-chloride narcosis lasting twenty minutes "provoked a definite cure."

J. B. Thomas.

Lowell, W. H., and Walker, C. E., Jr. The measured correction of squint. Amer. Jour. Ophth., 1937, v. 20, May, pp. 518-520.

Michaelson, I. C. A trial spectacle for prism prescription. Brit. Jour. Ophth., 1937, v. 21, May, pp. 232-233.

The spectacles described are to be used by the patient at home to de-

termine whether prismatic correction is advisable. Most vertical phorias encountered in practice as well as low degrees of horizontal phoria may be successfully measured with this contrivance.

D. F. Harbridge.

Nordstedt, A. Strabismus in identical twins. Det oftalmologiske Selskab i København's Forhandlinger, 1935-1936, p. 1. In Hospitalstidende, 1936, Dec. 15.

Identical twins are expected to be symmetrical in every way. Male twins, six years old, are recorded, who seem in all respects symmetrical. Both have convergent strabismus with defective action of the externi, one being amblyopic in the right eye and the other in the left.

D. L. Tilderquist.

Ohm, J. Nystagmus. 41st communication. Graefe's Arch., 1937, v. 137, pt. 1, p. 142.

The nystagmus of a one-year-old boy showed slow pendulum-like movements. He remained a partial albino, the corrected vision at five years of age being right 3/16 and left 2/16. Numerous curves of the nystagmus were made at the latter age, when it was found that the movements consisted of pendulum and jerk motions. The first are primary both in development and stability, for they are never absent. The cause apparently lies in the partial albinism. H. D. Lamb.

Schmidt, Rolf. Vertical reading. Klin. M. f. Augenh., 1937, v. 98, Feb., p. 177.

An albino of 44 years with horizontal nystagmus of about 150 oscillations per minute could read print only if the lines were in vertical position. He had noticed this as early as in the first classes of school. Nystagmic individuals who are annoyed by pseudomovements find these much lessened upon turning the head obliquely. They also discover that print becomes clearer when the book is turned 90°, and from early youth they become habituated to this mode of reading.

C. Zimmermann.

Seale, E. A. Oral sepsis as a cause of paralysis of external ocular muscles.

South African Med. Jour., 1936, v. 10, Nov. 28, p. 779.

A case of paralysis of the external rectus and one of paralysis of the superior rectus, due to oral sepsis, are reported.
Edna M. Reynolds.

Snell, A. C. **A statistical study of functional muscle tests in axial myopia.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1936, 87th annual session, p. 49.

In a tabulation of 1,078 consecutive cases of myopia, esophoria compared with exophoria was present in the ratio of two to one up to the age of forty years, and this ratio was not notably influenced by the degree of myopia or by the correcting glasses. The degree and relative frequency of exophoria both increase moderately after forty. Esophoria was present in 55.3 percent, exophoria in 30.4 percent, orthophoria in 9.6 percent, and simple hyperphoria in 4.7 percent. Convergence insufficiency is not a special characteristic of myopia. It was found in one percent of the smaller series of cases. Myopes maintain their power of convergence. The average amplitude of convergence was found to be greater than normal in 90 of 100 consecutive cases. (One table, 2 charts, discussion.)

George H. Stine.

Strebel, J. **A method of visualizing and measuring the positive rotation angle of the inferior-rectus muscle in convergence depression. Indications and results of operation in esophoria with diplopia.** Klin. M. f. Augenh., 1937, v. 98, March, p. 328.

The method consists in producing by prisms esophoria with noncrossed double images, and studying the homonymous false image in different degrees of convergence depression. It is explained and discussed in detail.

C. Zimmermann.

Torres Estrada, A. **A new scheme for diagnosis and record of paralyses of the extrinsic muscles of the eye.** Anales Soc. Mexicana de Oft. y Oto-Rino-Laring., 1936, v. 11, Oct.-Dec., pp. 90-98.

In the author's arrangement the direction of the muscle, its action, and

the projection of the false image are superimposed.
W. H. Crisp.

5

CONJUNCTIVA

Busacca, Archimede. **Is trachoma a rickettsial disease?** Arch. of Ophth., 1937, v. 17, Jan., pp. 117-126.

By means of impression smears the author has found rickettsia-like bodies which appear as small granules, round or slightly elongated, sometimes isolated, sometimes joined in dumb-bell form, sometimes in masses. These are best shown with Victoria-blue staining according to the method of Herzberg. Attempts to demonstrate the rickettsia-like bodies in experimental material have not as yet given very satisfactory results. However, the author was able to demonstrate some of these bodies in smears made from fragments of the nictitating membrane of a fowl inoculated with glycerinated trachomatous material.

J. Hewitt Judd.

Cadei, Ercole. **A case of voluminous glandular cyst of the conjunctiva of traumatic origin.** Boll. d'Ocul., 1936, v. 15, Dec., pp. 1285-1293.

A boy of seven years whose left eye had been burned by hot ashes at the age of two years showed complete ptosis of the upper lid due to a soft tumorlike formation. The skin was easily movable. Forced eversion of the lid showed a cystlike grayish mass covered by conjunctiva. The cyst was enucleated. Histologic study showed it to have arisen either from dilatation of the excretory duct of Krause's gland or from cystic dilatation of an excretory duct of the orbital lacrimal gland. (Bibliography, 6 figures.)

M. Lombardo.

Cassuto, Nathan. **Conjunctival affections from bipolar bacilli.** Boll. d'Ocul., 1936, v. 15, Dec., pp. 1239-1260.

A woman of 32 years affected by photophobia and lachrimation of the left eye had for some time shown a nodule of pinkish-yellow color, covered by hyperemic conjunctiva, 3 or 4 mm. from the limbus at the 1-o'clock meridian.

The patient tended a chicken farm. The conjunctiva was incised and the nodule curetted away. A man of 23 years affected by lacrimation and photophobia for about 25 days showed 4 mm. from the limbus of the left eye, at the temporal end of the horizontal meridian, a yellowish nodule covered by an intensely injected conjunctiva. The patient was in contact with chickens, oxen, pigs, and rabbits. The nodule was curetted. From bacteriologic examination of the curetted material in both cases was isolated a germ which morphologically, biologically, pathologically, and immunologically belonged to the Pasteurella, or bacillus of the hemorrhagic septicemias. To the Pasteurella, the *B. pseudotuberculosis* rodentium, and the *B. tularensis* the author applies the name "bipolar bacilli" because of their bipolar staining. (Bibliography, 6 figures.) M. Lombardo.

Claes, Elsa. **Severe bilateral purulent conjunctivitis caused by accidental infection.** Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 120.

A veterinary surgeon delivered a mare of twin foals, one of them dead and macerated. Both the surgeon and the living foal developed a severe ocular infection probably streptococcal in origin.

J. B. Thomas.

Clay, G. E., and Baird, J. M. **Restoration of the orbit and repair of conjunctival defects.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1936, 87th session, p. 252. (See Amer. Jour. Ophth., 1937, v. 20, Jan., p. 105.)

Cuénod, A., and Nataf, Roger. **Experimental trachoma researches.** Bull. Soc. Franç. d'Ophth., 1936, v. 49, pp. 19-22.

Cuénod gives a résumé of his trachoma research begun in 1907, wherein he demonstrated the sensitivity of Algerian monkeys (*Macacus inuus*) to trachoma and the existence in that animal of an experimental trachoma. The characteristics of the virus were established; notably its resistance to cold for many days, its destruction by temperature of 50°C. for a half hour, and the

possibility of filtering the virus under certain circumstances.

When *Rickettsia* virus is placed in the anal canal of the louse, then in a few days, often in a few hours, relatively voluminous colonies develop in the lower part of the intestinal canal. Because of lack of culture material the authors attempted to inoculate trachoma virus into the intestine of the louse, with encouraging results. (See Amer. Jour. Ophth., 1936, v. 19, p. 929.) *Rickettsia* bodies plainly showed on the fifth day. On the other hand many cases of infantile conjunctival folliculosis proved negative.

In another series of experimental research the authors injected the conjunctiva of two monkeys with the ground-up material of lice infected with trachoma virus. The conjunctiva had been previously examined and found free of follicles. It now developed discrete trachoma lesions after a quiet period of fifteen days. Their experience leads them to believe that trachoma virus may well be related to the family of *Rickettsia*, and that if the louse is not necessarily an agent of transmission of trachoma, it may be considered a reservoir of trachoma virus.

Clarence W. Rainey.

Haas, M. E. **Four cases of diphtheric conjunctivitis without pseudomembrane occurring in diphtheria of the nose or throat.** Bull. Soc. Franç. d'Ophth., 1936, v. 49, pp. 66-73.

The author finds diphtheric conjunctivitis without pseudomembrane relatively frequent, but has never seen a case with false membrane. Two followed nasal diphtheria without findings in the pharynx. The third was one of diphtheria in a patient having another general condition not well determined. The fourth case followed a seemingly innocent sore throat.

Diphtheric conjunctivitis without false membrane is accompanied by mild edema, without induration, often of the lower lid only, with a vivid color of the skin, the tarsal conjunctiva and that of the inferior cul-de-sac. There is a swelling of the related lymph glands.

Clarence W. Rainey.

Jaeger, A. de. **Results obtained with antileprol injections.** Bull. Soc. Belge d'Opt., 1936, no. 73, p. 90.

Two cases of chronic trachoma with severe manifestations were treated by intravenous injections of antileprol, a preparation of chaulmoogra, without using the drug locally at the same time. Both patients were markedly benefited by the treatment, which the writer recommends particularly in acute exacerbations of trachoma and in certain serious, subacute affections of the cornea. He has not encountered any serious accidents in using the intravenous route for his injections but in discussing the paper two speakers emphasized the element of shock and advised caution.

J. B. Thomas.

MacCallan, A. F. **Introduction to a discussion on the treatment of trachomatous conjunctivitis in children from birth to ten years of age.** Rev. Internat. du Trachome, 1936, v. 13, Oct., p. 171.

The author discusses very briefly differential diagnosis and treatment.

J. Wesley McKinney.

Mihail, A. C. **Researches on the leukocytic formula in trachoma.** Rev. Internat. du Trachome, 1936, v. 13, Oct., p. 193.

The author studied the leukocytic formula in twenty normal and 41 trachomatous individuals, and noted a certain increase in the mononuclear elements and a corresponding diminution in the polynuclear elements. Eosinophilia was found only when parasitic infestation of the intestine was present. The author concludes that monocytosis does not represent a constant characteristic of trachoma in general or of any of its stages. J. Wesley McKinney.

Olah, Emil. **The healing of trachoma.** Klin. M. f. Augenh., 1937, v. 98, March, p. 350.

A man had trachoma 25 years ago, from which he completely recovered after a few years' treatment. At that time several physicians declared that the trachoma was entirely healed, and the patient had no trouble for more than two decades. Two years ago the right eye

became blind from leucoma adherens after a corneal ulcer. On readmission the lower two thirds of the left cornea was covered by a serpent ulcer with hypopyon ending upward in a horizontal line. The upper third of the cornea showed typical trachomatous pannus, which was sharply separated from the ulcer. The case seemed to prove that an inflammation of the anterior segment of the eye is apt to disclose the presence of latent trachoma and that this regains its infectiousness.

C. Zimmermann.

Poleff, Z. **Culture of the rickettsias of trachoma in vitro.** Arch. d'Opt., 1936, v. 53, Dec., p. 882.

The author, utilizing the modern technique of tissue culture, has succeeded in culturing trachomatous tissue and isolating rickettsia bodies up to the fifth passage. An intimate relationship exists between these bodies and the inclusions of Prowazek-Halberstaedter. The specific nature of these formations (in culture) will be determined by future inoculation and immunization experiments. There exists a certain morphologic resemblance between the rickettsias and Bacterium granulosis of Noguchi. (Illustrations, bibliography.)

Derrick Vail.

Riedl, Franz. **Gumma of the bulbar conjunctiva in congenital lues.** Zeit. f. Augenh., 1937, v. 91, March, p. 273.

Because of its extreme rarity, the author describes a gumma excised from the bulbar conjunctiva of a fifteen-year-old congenitally luetic girl. The diagnosis was made on the basis of appearance, previous appearance of gumma elsewhere in the patient, and family history. Sclera and cornea remained entirely uninvolved. One half of the gumma was introduced into the anterior chamber of a rabbit but failed to induce infection. F. Herbert Haessler.

Sédan, Jean. **Lacrimal and traumatic factors in unilateral trachoma.** Rev. Internat. du Trachome, 1936, v. 13, Oct., p. 184.

Here are presented 24 cases of uni-

lateral trachoma, with a review of the literature. The permeability of the nasolacrimal passages was studied. Permeability was classified as spontaneous if fluid instilled into the conjunctival sac appeared in the nose more or less rapidly; as induced if a syringe was necessary for irrigation into the nose. Twenty of the cases showed a permeable nasolacrimal apparatus on the unaffected side and either spontaneous or induced permeability of the affected side. Three were impermeable on both sides. The author does not attempt to draw definite conclusions. Trauma seemed to play some part in three cases.

J. Wesley McKinney.

Tillé, Chapuis, and Bory. *Pemphigus of the eye and of the soft palate.* Bull. Soc. Franç. d'Opht., 1936, v. 49, pp. 38-54.

The authors report observations on two patients. The first presented pemphigus of the mucous membrane of the conjunctiva and of the soft palate and pharynx with grave general symptoms and signs of endocrine disturbance (subacute malignant pemphigus). Gray vascularized cicatricial bands obliterated the conjunctival culdesacs and encroached upon the corneas. The patient complained of pharyngeal pain occurring in crises. Bleeding from the nose required tampons. On the soft palate there was a bulla 3 by 1 cm., serous fluid from which was negative bacteriologically. The disease was followed by complete obliteration of the conjunctival fornix and complete invasion of the cornea.

The second patient presented similar eye findings, together with ichthyosis of the trunk, lesions of the nails, hyperkeratosic lesions of the palms and soles with fissures, and scleroderma of the face and the backs of the hands with atrophy of the skin and telangiectasis.

The author concludes that the ocular syndrome seems always to be the same; mainly, the retraction of the conjunctiva. There is a likeness between the group of pemphigus cases and the allied conditions of dermatitis and hyperkeratosis ichthyosiforme.

Clarence W. Rainey.

Trapezontzeva, E. *Filtrability and filtrating elements of Bacterium granulosis Noguchi.* Sovietskii Viestnik Opht., 1937, v. 9, pt. 4, p. 437.

In transferring cultures of *Bacterium granulosis* which had been kept in vaselin over two years, the author found atypical elements. Along the long axis of the rods were situated small gram-positive granules, larger than the red-stained bacillus: they were arranged in groups of four or five in the center or at the poles, apparently free in the substance of the bacillus. These cultures were passed through a Chamberlain L³ filter and studies with the filtrate indicated that while the Noguchi bacillus did not pass through the filter these atypical granules were filtrable. (Illustrations.) Ray K. Daily.

Trapesontzeva, E. *Trachoma and Bacillus granulosis Noguchi.* Sovietskii Viestnik Opht., 1936, v. 9, pt. 4, p. 441.

A review of the literature and an analysis of the author's findings in 136 agglutination tests for trachoma. The reaction becomes more positive with development of clinical symptoms and may be negative in incipient cases. For accurate results the mixture of serum and bacterial suspension should be kept at 50 to 52° for not less than twelve to eighteen hours. Ray K. Daily.

Wibaut. *Treatment of trachoma in children under ten years of age.* Rev. Internat. du Trachome, 1936, v. 13, Oct., p. 174.

The author describes the treatment in two age groups. In the group under five years, typical granulations are often not present. In these cases a return of the conjunctiva to normal may be expected, with proper care. The use of strong caustics is advised against.

J. Wesley McKinney.

Zachert, M. *Pointers for the general practitioner on the treatment of trachoma.* Rev. Internat. du Trachome, 1936, v. 13, Oct., p. 177.

This paper is for the general practitioner in trachomatous areas where the number of oculists is insufficient to care for all cases. The author deals only

with those under ten years of age. First there should be a preparatory period lasting one month to familiarize the child with the treatment. During this period solutions of silver nitrate, zinc sulphate, and other astringents are instilled. The procedure of "frottage" is combined with the use of chaulmoogra oil. In this manner a return to normal may be expected in most cases.

J. Wesley McKinney.

Zachert, M. **Principles of treatment of trachoma in infants.** Bull. Soc. Franç. d'Ophth., 1936, v. 49, pp. 23-26.

The great resistance of infants to the development of trachoma explains the easy regression of the lesions. One should always choose the gentlest methods of preparatory treatment to combat secretion, edema, and hyperemia. The preparatory treatment is continued four weeks to enable the physician to verify the diagnosis. The forceps of Knapp and Kuntz are not used on account of the scars formed. The author prefers expression with a rod, combining mechanical pressure with friction and with a medicament. Chaulmoogra oil has numerous advantages. The method gives excellent results. The granulations disappear and the conjunctiva returns to normal. Post-trachomatous conjunctivitis requires secondary treatment of long duration with copper or alum stick. Refractory cases are often due to a scrofulous diathesis.

Clarence W. Rainey.

6

CORNEA AND SCLERA

Bossalino, Giuseppe. **Contribution to the study of filamentous keratitis.** Boll. d'Ocul., 1937, v. 15, Nov., pp. 1193-1214.

A luetic woman of 37 years affected by recurrent attacks of photophobia and a sense of dryness of the eyes and mouth showed some whitish filaments 2 or 3 mm. long, of spiral shape and adherent to the cornea by large bases. Around these filaments the corneal epithelium was swollen, forming small white bullae transparent at their centers. Removal of these filaments was followed by improvement in the subjective symptoms.

The writer thinks that the lues had no direct influence in genesis of the filaments but that the deficiency in lacrimal secretion caused changes in the corneal epithelium and hence formation of the filaments. The deficient secretion of the lacrimal glands is attributed to hypofunction of the suprarenal-sympathetic system. (Bibliography, 4 figures.)

M. Lombardo.

Curin, Juraj. **Juvenile epithelial dystrophy.** Zeit. f. Augenh., 1937, v. 91, Feb., p. 185.

The author reports the case of a six-year-old child with a condition similar to that described by Kraupa (see Amer. Jour. Ophth., 1934, v. 17, p. 981.)

In an otherwise normal child with negative Wassermann and tuberculin reactions, both corneae were defective since birth. Lids, conjunctiva, limbal blood vessels, and a peripheral corneal zone 2 mm. wide were normal. In the central area of each cornea the epithelium was edematous, and had contiguous vesicles as in glaucoma. The parenchyma had delicate translucent stripes. Corneal sensitivity, anterior chamber, and iris were normal. No nystagmus or increased tension was noted.

F. Herbert Haessler.

Ellis, R. W. B., Sheldon, W., and Capon, N. B. **Gargoylism (chondro-osteodystrophy, corneal opacities, hepatosplenomegaly, and mental deficiency).** Quart. Jour. of Med., 1936, v. 5, Jan., p. 119.

The authors present seven cases with this syndrome. The corneae show diffuse multiple opacities chiefly in the deeper layers. Their nature is obscure and they bear no relationship to vitamin-A deficiency or to lues. Ten cases in the literature are reviewed.

Theodore M. Shapira.

Filatov, B. P. **Alloplastic surgery in hopeless leucomas.** Sovietskii Viestnik Ophth., 1937, v. 9, pt. 4, p. 400.

In a hopeless case of bilateral leucoma the author first covered the leucomas with double conjunctival flaps. One month later when healing was

complete, he turned the flap down, trephined the leucoma, introduced into the opening a cone-shaped piece of glass, and sutured the conjunctival flap over it. The conjunctiva over the glass gradually became thinner, and six months after the operation vision was 1/180.

Ray K. Daily.

Graf, Kornelja. **Chronic intermittent corneal edema as an expression of angioneurosis.** *Zeit. f. Augenh.*, 1937, v. 91, March, p. 278.

The author reports in detail on two cases of chronic intermittent corneal edema. Both patients had vague subjective manifestations which made them conscious of the eye, including color rings about lights. There was central epithelial edema without breaking of the surface. In the deepest layers many corneal nerves could actually be observed to disappear as the attack wore off. There was a distinct disturbance of the endothelium, a disappearance of the hexagonal contour markings, holes in the mosaic, and fine glistening points of light giving the appearance that Vogt compares to fractured brass.

F. Herbert Haessler.

Haldimann, Carl. **On parenchymatous keratitis in congenital lues of the second generation.** *Zeit. f. Augenh.*, 1937, v. 91, Feb., p. 183.

As a supplement to his earlier communication (see Amer. Jour. Ophth., 1937, v. 20, p. 221), the author records reference to three communications which he has found since that publication.

F. Herbert Haessler.

Hamburger, F. A. **Prophylaxis of serpent ulcer with collargol ointment.** *Zeit. f. Augenh.*, 1937, v. 91, March, p. 265. (See Section 16, Injuries.)

Kiehle, F. A. **Scleromalacia.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 565-570; also Trans. Amer. Acad. Ophth. and Otolaryng., 1936, 41st meeting, p. 545.

Lisch, Karl. **Hereditary occurrence of Sjogren's symptom complex with keratoconjunctivitis sicca.** Arch. f. Augenh.,

1937, v. 110, March, p. 357. (See Section 17, Systemic diseases and parasites.)

Moretti, Egisto. **Acute hemorrhagic bulla of the cornea.** Boll. d'Ocul., 1936, v. 15, Dec., pp. 1275-1384. (See Amer. Jour. Ophth., 1937, v. 20, Jan., p. 86.)

Neminskii, E. M., and Salkin, V. P. **Treatment of corneal tuberculosis with tuberculin.** Sovietskii Viestnik Ophth., 1936, v. 9, pt. 4, p. 476.

From histories of 32 cases of tuberculous kerato-iritis the author concludes that in this disease tuberculin should be used only for cases which do not respond to local and constitutional measures. The doses should be only large enough to provoke a barely perceptible focal reaction.

Ray K. Daily.

Potvin, M. **Cholesterolemia and its corneal manifestations.** Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 86.

Cholesterol takes part in the constitution of the cellular protoplasm where it is fixed. It is found equally in circulation in the blood cells and plasma. Adsorption of the plasma-cholesterol by the blood cells in the course of the respiratory act and the "solubilization" of the blood-cell cholesterol in the plasma within the tissues, are regulated by the acid-basic equilibrium. "Arcus senilis" occurs in young persons with a high percentage of blood cholesterol and it has been proposed that the term "arcus senilis" be replaced by "cholesteremic arc." Prolonged observation of ten cases of cholesterolemia in the young, all with hepatic insufficiency and bearers of gerontoxon, enabled the author to study the late corneal manifestations of cholesterolemia, such as marginal ulceration of the cornea, keratitis with iritis, and corneal edema followed by epithelial desquamation. (17 references.)

J. B. Thomas.

Reiser, K. A. **Changes in the corneal nerve apparatus after extirpation of the semilunar (gasserian) ganglion in rabbits.** Arch. f. Augenh., 1937, v. 110, March, p. 253.

Thirty hours after extirpation of the

gasserian ganglion the first signs of degeneration appear in the coarse nerve bundles of the cornea. The degeneration may take on the appearance of knotty swelling, of nerve fibers clustering in broad bands traversed by round formations due to fibrillolysis, or of breaking up of nerve fibers into rows of beads. The degenerative signs become fewer toward the peripheral portion of the nerve fibers. In the terminal reticulum no pathologic alteration is found. This proves the syncytial construction of the peripheral nerve elements.

The author discusses the various theories concerning neuroparalytic keratitis. He adheres to the theory advanced by Behr, that irregular stimuli caused by changes in the gasserian ganglion lead to irregular function of the ophthalmic branch of the nerve. Excision of the ganglion will not lead to neuroparalytic keratitis if at the corneal margin sufficiently strong anastomoses are formed with fibers originating from the facial nerve and with fibers of the vegetative nerve system.

R. Grunfeld.

Rycroft, B. W. **Corneal graft in an aphakic eye.** Lancet, 1936, Sept, v. 231, p. 743.

The authors were able to graft clear cornea upon an aphakic eye which had previously had severe ophthalmia neonatorum. The patient's vision increased so that she was able to read 2-inch letters. An interesting feature of this case was that nystagmus, which was very prominent, practically disappeared after the eye was able to fix.

M. E. Marcove.

Szász, A. **A peculiar case of xanthomatosis cornea.** Arch. f. Augenh., 1937, v. 110, March, p. 373.

The cornea was damaged by trachomatous pannus, which later became infiltrated with fat, with so much formation of yellowish tissue that it resembled a tumor. The proliferation was removed without opening the globe. The granulation tissue soon returned to its former size. After enucleation the microscope revealed characteristic xanthoma cells. The inner struc-

tures of the eyeball were free from fat infiltration. The blood cholesterol reached the upper normal limit, namely 176 mg. per 100 c.c. of blood.

R. Grunfeld.

Thomas, J. W. T. **The results of corneal transplantation.** Brit. Med. Jour., 1937, Jan. 16, p. 114.

An account of the results of corneal transplantation as carried out by four ophthalmic surgeons is given, with a scheme for classification of results. In favorable cases 50 percent of the operations have been successful and in unfavorable cases 38 percent. A higher percentage of successes has been secured by surgeons who follow the principle of preparing the grafts with shelving margins. Edna M. Reynolds.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Appelmans, M., and Michiels, F. **Congenital bilateral aniridia.** Bull. Soc. Belge d'Opht., 1936, no. 73, p. 36.

A case report illustrated with one figure. The vision was "fairly good," there was no photophobia, but horizontal nystagmus was present.

J. B. Thomas.

Bedell, A. J. **Choroideremia.** Arch. of Ophth., 1937, v. 17, March, pp. 444-467.

The cases reported in the literature are reviewed. Five new cases are described in detail and are illustrated with fundus photographs. This condition consists of a bilateral loss of choroid occurring in the male, accompanied by night blindness and contraction of the visual field. The macular region is usually intact, preserving central vision until very late in the course of the disease. Vessels of the choroid are small and straight or entirely absent and there is no ectasia of the sclera. The differential diagnosis is discussed. (Bibliography.) J. Hewitt Judd.

Black, George. **Severe bilateral iridocyclitis following pregnancy.** Trans.

Ophth. Soc. United Kingdom, 1936, v. 56, p. 264.

Ten and five months following delivery the left and right eyes respectively became involved, and opaque vascularized corneas resulted, with vision of hand movements. Tuberculin and Wassermann tests were negative. Infected tonsils were removed and general treatment included bed rest outdoors, ultraviolet-light baths, heat, atropine, and a course of salvarsan. Ultimate opacification of both corneas resulted.

Beulah Cushman.

Blobner, Ferdinand. **Recurrent hypopyon iritis.** Zeit. f. Augenh., 1937, v. 91, Feb., p. 129.

Extensive excerpts are presented from the clinical records of a patient who had been observed and treated since 1930 for recurrent hypopyon iritis. In 1935 it became necessary to enucleate one eye. Early in 1936 the patient had a dry pleurisy. Despite exhaustive studies, no septic foci were found. The author feels that tuberculosis can be ruled out with great probability. If slow sepsis was a likely cause, it was not the only factor. Certainly a modified reactivity of the patient was partly responsible. There was no benefit from atropine, heat, dionin, subconjunctival salt, tuberculin, arsenic, atophanyl, salicylates, or radiant energy. Recurrences came at shorter and shorter intervals; finally every eighteen days. After a transfusion, the patient went elsewhere for a rather radical treatment designed to modify his allergic state. He has now been free from recurrence for one year, and the author believes that one (or perhaps both) of the latter therapeutic attempts was effective and responsible for the healing. F. Herbert Haessler.

Brown, A. L. **Uveitis; the role of intraocular typhoid-antibody content in treatment.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 583-591.

Casini, F. **The behavior of the iridodilator and iridoconstrictor nerves in the presence of mydriatics and miotics in experimental hypocalcemia and hy-**

percalcemia. Arch. di Ottal., 1936, v. 43, Dec., p. 231.

The author's study revealed that the excitability of the iridoconstrictor and iridodilator fibers is diminished when the blood calcium is diminished. The question whether the fibers belong to the sympathetic system or the parasympathetic system is held unimportant. The defective reaction was found to be due entirely to the chemical disturbance by blood calcium.

H. D. Scarney.

Cattaneo, Donato. **Hypertensive iridocyclitis.** Boll. d'Ocul., 1936, v. 15, Nov., pp. 1115-1141. (See Section 8, Glaucoma and ocular tension.)

Ciotola, Guido. **Unilateral Argyll Robertson symptom consecutive to zona ophthalmica.** Boll. d'Ocul., 1936, v. 15, Dec., pp. 1294-1303.

A woman of 66 years who twenty months before had been affected by right zona ophthalmica manifested anesthesia of the skin of the forehead, upper lid, and cornea, while the corresponding pupil was smaller and showed abolition of the photomotor reflex with preservation of other reflexes. The clinical side of the phenomenon and the possible pathogenesis are discussed. (Bibliography.) M. Lombardo.

Claes, Elsa. **An uncommon form of remains of the pupillary membrane.** Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 45.

Two illustrations and eight references.

Fledelius, Mogens. **Iridocyclitis in Weil's disease.** Det oft. Selskab i København's Forhandlinger, 1935-1936, pp. 41-45. In Hospitalstidende, 1936, Dec. 15.

Two cases of Weil's disease are described in both of which appeared symptoms of iridocyclitis: numerous fine precipitates on the posterior surface of the cornea, moderate injection of the iris with photophobia, and disturbance of vision. In both instances the eye symptoms appeared in the period of convalescence, and, while the

symptoms were relatively mild, traces of the disorder remained a long time. In one case the precipitates were still present six months after onset of the disease.

D. L. Tilderquist.

Frommel, E., and Zimmet, D. Does ergotamine tartrate paralyze the iris sympathetic? *Ann. d'Ocul.*, 1937, v. 174, March, pp. 178-182.

An attempt was made to demonstrate whether or not the miosis produced by ergotamine tartrate was the result of paralysis of the sympathetic fibers to the dilator of the pupil. In the rabbit direct electric stimulation of the retro-carotid sympathetic produced maximal mydriasis, overcoming the miosis induced by intravenous injection of ergotamine tartrate. Injection of epinephrine also produced mydriasis in the presence of ergotamine miosis. In similar experiments conducted on enucleated eyes of frogs, ergotamine did not prevent dilatation of the pupil by epinephrine. It is concluded that ergotamine does not totally paralyze the ocular sympathetic system.

John C. Long.

Hudelo, A., and Voisin, J. Miliary tuberculosis of the choroid. *Arch. d'Oph. and Rev. Gen. d'Oph.*, 1937, v. 1, n.s., March, p. 198.

A man aged 36 years was admitted to the hospital with diagnosis first of alcoholism, then hepatic septicemia, and finally meningitis. Ophthalmologic examination revealed the true nature of the disease to be miliary tuberculosis, with typical choroidal lesions. Histopathologic examination showed choroidal tubercles in various stages of development. (Illustrations, bibliography.)

Derrick Vail.

Kronfeld, P. C., and Lin, C. K. Effect of cocaine upon protein content of regenerated aqueous humor. *Proc. Soc. Exper. Biol. and Med.*, 1936, v. 35, Dec., p. 401.

The increase in the protein content of the human aqueous after paracentesis was found to be much greater when an anesthetic without vasoconstrictor

action was used than when cocaine was used.

Edna M. Reynolds.

Kurz, Otto. Diabetic rubeosis of the iris. *Arch. f. Augenh.*, 1937, v. 110, March, p. 284.

Proliferation of vessels in the pupillary and ciliary portions of the iris stroma had led to synechias at the iris root. The condition is occasionally associated with hemorrhagic diabetic retinitis and with proliferation of retinal vessels. Generally glaucoma ensues. Conservative glaucoma therapy is of no avail and operation gives only temporary relief. The new vessels lie in the iris stroma itself and not in superimposed connective tissue; they disappear with atrophy of the stroma. Arterial hypertension seems to be responsible for the appearance of the rubeosis. The anatomic changes in the vessel wall are relatively slight and not specific.

R. Grunfeld.

Lamb, H. D. Chronic tuberculous uveitis. *Amer. Jour. Ophth.*, 1937, v. 20, May, pp. 490-496; also *Trans. Sec. on Ophth.*, Amer. Med. Assoc., 1936, 87th session, p. 65.

Lewis, G. E., Raines, R., and Stewart, D. S. Uveoparotitis. *Lancet*, 1936, v. 231, Nov. 21, p. 1204.

The parotid swellings preceded the visual symptoms. The parotitis was bilateral, while the ocular signs were confined entirely to the right eye. The literature is reviewed and the theories of causation are discussed. The authors suggest that uveoparotitis is a manifestation of local tissue hypersensitivity due to any one of a variety of allergens. While tuberculosis may often be the allergen responsible they think that it is unwise to regard all cases of uveoparotitis as tuberculous.

Edna M. Reynolds.

Marković, Acim. Simultaneous double paracentesis of the cornea in isolating cicatrized prolapses of the iris. *Klin. M. f. Augenh.*, 1937, v. 98, Feb., p. 187.

The instrument consists of two bent lance-shaped knives which by the spring of their crossed handles are

pressed together, so that they form as it were a single lance surface. By pressing the handles with the fingers the knives are spread apart, the distance being adjusted by a screw so as to leave the iris prolapse between in incising at the limbus. C. Zimmermann.

Nasarov, I. I. **Mushroom-like nodules of the iris in tuberculous leprosy.** Soviet-skii Viestnik Ophth., 1936, v. 9, pt. 4, p. 495.

A report of a case of a leper with a peculiar involvement of the iris, with pupil fixed and oval, and without inflammatory phenomena. The region of the circulus iridis minor was invaded by numerous pin-head-size ivory-colored nodules. With the slitlamp they could be seen to arise from the substance of the iris and to have a mushroom shape. Ray K. Daily.

Neminskii, E. M., and Salkin, V. P. **Treatment of corneal tuberculosis with tuberculin.** Sovietskii Viestnik Ophth., 1936, v. 9, pt. 4, p. 476. (See Section 6, Cornea and sclera.)

Oláh, Emil. **How is it possible to exclude the technical difficulties of puncture of the anterior chamber with cicatrically shortened retrotarsal fold?** Klin. M. f. Augenh., 1937, v. 98, March, p. 349.

The lower limbus could not be exposed with any stop speculum without interference by the shortened lower lid. The author protected and pulled down the lower lid with a spatula. (Illustration.) C. Zimmermann.

Strandbygaard, B. **Sympathetic ophthalmia treated with red light.** Det oft. Selskab i Köbenhavn's Forhandlinger, 1935-1936, pp. 32-35. In Hospitalstidende, 1936, Dec. 15.

On August 15, 1894, a woman, 44 years of age, sustained an injury to the right eye by a blow by a cow's horn, resulting in subconjunctival scleral rupture, with hernia of the iris and complete loss of vision. Four weeks later the left eye became involved, showing circumcorneal injection, swelling of the iris, and adhesions of the pu-

illary margin to the lens. In the course of two weeks the vision fell to counting fingers at 20 feet. The right eye was enucleated, but the left eye became steadily worse. A red glass was placed before the eye and other light excluded. Improvement began and in two months the eye had become nearly well and the vision had improved so that the patient could read ordinary type. A year later the eye was still well and the vision good.

D. L. Tilderquist.

Waldmann, Bela. **The rhinogenic origin of sympathetic ophthalmia.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 618-625.

Wiener, M., and Alvis, B. Y. **The use of concentrated epinephrin preparations in glaucoma, iritis, and related conditions.** Amer. Acad. Ophth. and Otolarygn., 1936, 41st meeting, p. 521. (See Amer. Jour. Ophth., 1937, v. 20, May, p. 497.)

8

GLAUCOMA AND OCULAR TENSION

Barkan, Otto. **Recent advances in the surgery of chronic glaucoma.** Trans. Amer. Acad. Ophth. and Otolaryng., 1936, 41st meeting, p. 469.

The procedure of opening Schlemm's canal under direct vision (goniotomy) involves a new principle in the surgery of glaucoma. The operation is without danger, and has proved successful in every one of twenty cases operated upon, and in which preoperative gonioscopy indicated blockage of the trabeculum. The operation is equally successful in certain cases of secondary glaucoma and in certain cases of primary glaucoma other than the chronic simple type I. Biomicroscopic gonioscopy is a useful diagnostic adjunct and often permits earlier diagnosis of glaucoma. (3 figures, discussion.)

George H. Stine.

Ehlers, Holger. **Capsular glaucoma.** Det oftalmologiske Selskab i Köbenhavn's Forhandlinger, 1935-1936, pp. 30-32. In Hospitalstidende, 1936, Dec. 15.

In a case of simple glaucoma there

was observed a grayish layer or deposit on the anterior lens capsule in the pupillary area. After dilating the pupil with glauconan, similar deposits, some finely punctate and some irregularly massed, were observed under the slit-lamp over the whole anterior capsule. In some places they gave the appearance of having been scraped away from the lens capsule. Other observers have described similar deposits in simple glaucoma and designated them as senile exfoliations of the lens capsule. They are said to occur so often that the suspicion arises that they may be the cause of simple glaucoma.

D. L. Tilderquist.

Filatov, K. P. **Surgical prophylaxis of explosive hemorrhage.** Sovietskii Viestnik Opht., 1936, v. 9, pt. 4, p. 405.

The author reports eight cases of posterior sclerectomy preliminary to operations for cataract or glaucoma, with good results. The effect of the sclerectomy is to provide an exit for the blood from the suprachoroidal space, should explosive hemorrhage occur, and to reduce the possibility of such an occurrence by diminishing the ocular tension. The author considers this operation indicated in all cases in which one eye has been lost from explosive hemorrhage; and also of cases of cataract with glaucoma, and in glaucoma with very high tension and narrow fields.

Ray K. Daily.

Friedenwald, J. S., and Pierce, H. F. **Circulation of the aqueous. 6, Intraocular gas exchange.** Arch. of Ophth., 1937, v. 17, March, pp. 477-485.

In these experiments a measured volume of aqueous was replaced by bubbles of gas, either air or nitrogen, and then samples of the bubbles of gas were removed at varying intervals for chemical determination. It was found that the gas content of the aqueous was not influenced by the metabolism of the retina, that the permeability of the cornea to gases was subject to marked fluctuation, and that there was no reciprocal permeability of the iris or the ciliary body to oxygen. The partial pressure of oxygen in the posterior

chamber is substantially higher than in the anterior chamber, and the difference is due to the oxygen consumption of the lens, which is estimated to be from 0.2 to 0.5 c. mm. per minute. Hence the aqueous has a definite respiratory function in supplying oxygen for consumption by the lens.

J. Hewitt Judd.

Grósz, Etienne de. **Intraocular tension and pregnancy.** Ann. d'Ocul., 1937, v. 174, March, pp. 167-177.

Studies of intraocular tension were made on 105 women at different stages of pregnancy. The mean during the first half of pregnancy was 19.3 mm. and during the second half 16 mm. (Schiötz). The average pressure for nonpregnant women of the same age is 19 to 20 mm. This fall in intraocular pressure during pregnancy has been ascribed to modification of the pH of the blood, to hormonal (especially pituitary) influences, and to sympathetic nervous factors.

John C. Long.

Hůlka, J. H. **Changes in the intraocular tension due to the circulation of the aqueous in the ciliary body.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 627-630.

Jaswal, J. N. **Sedimentation of red blood cells in glaucoma and other ocular diseases.** Indian Med. Gaz., 1936, v. 71, Oct., p. 584.

The author studied the sedimentation rate of the red blood cells in people having eye diseases and found that in glaucoma the reading was 28.8 mm., the normal being from 5 to 10 mm. In glaucomatous patients with eye diseases it was 17.5 mm. In cataract cases it was 18 mm. It must be remembered however that the sedimentation rate rises with age and the figure of 5 to 10 mm. is normal for a young individual. Three patients were well up in years.

M. E. Marcove.

Swindle, P. F. **The principal drainage channels of the eye.** Arch. of Ophth., 1937, v. 17, March, pp. 420-443.

The network of drainage channels is divided into periscleral, midscleral, and

cavernous plexuses. The various anastomoses were demonstrated by injection of India ink into the anterior chamber and are illustrated by numerous photomicrographs. The periscleral network consists of the venous anastomoses of the conjunctiva, Tenon's capsule, and the episclera. The midscleral plexus is associated with the periscleral and the cavernous plexus through venous anastomoses which are more numerous in the vicinity of the limbus. At many points the cavernous plexus is associated with veins in iris and ciliary body. The veins and capillaries of the uveal portion of the cavernous plexus break down before birth and form some spaces of Fontana. The cavernous tissue of the sclera probably acts as a reservoir for aqueous and assists in equalizing intraocular pressure.

J. Hewitt Judd.

Wiener, M., and Alvis, B. Y. **The use of concentrated epinephrin preparations in glaucoma, iritis, and related conditions.** Amer. Acad. Ophth. and Otolaryng., 1936, 41st meeting, p. 521. (See Amer. Jour. Ophth., 1937, v. 20, May, p. 497.)

Wright, R. E. **Lectures on glaucoma.** 1. Certain aspects of glaucoma. 2. The operative treatment of glaucoma. Amer. Jour. Ophth., 1937, v. 20, May, pp. 462-468, and June, pp. 571-579.

9

CRYSTALLINE LENS

Awerbach, M. I. **Addition to my article on expulsive hemorrhage.** Soviet-skii Viestnik Ophth., 1936, v. 9, pt. 4, p. 409.

The author disclaims priority as to prophylactic use of posterior sclerectomy against expulsive hemorrhage. (See Amer. Jour. Ophth., 1936, v. 19, p. 947.) Ray K. Daily.

Ellett, E. C. **Use of the suture in extraction of cataract.** Arch. of Ophth., 1937, v. 17, March, pp. 523-529.

The four types of suture used are conjunctival, corneal, scleroconjunctival, and sclerocorneal. Each, with its

modifications, is described and discussed, and the advantages and disadvantages are outlined.

J. Hewitt Judd.

Filatov, K. P. **Surgical prophylaxis of expulsive hemorrhage.** Sovietskii Viestnik Ophth., 1936, v. 9, pt. 4, p. 405. (See Section 8, Glaucoma and ocular tension.)

François, Jules. **Antigenic properties of lens proteins.** Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 121.

This study is preliminary to a research concerning the influence of immunologic factors upon the production of cataract. From the standpoint of immunology the lens proteins are the same in all animals and different from other animal albumens. The author concludes from experiments on young rabbits that (1) the lens proteins possess antigenic properties, and their injection into an animal causes formation of specific precipitins in the blood serum, (2) the lens proteins possess organ specificity and not species specificity, (3) as early as two weeks after the first injection of lens matter these anti-lens precipitins appear in the blood serum, (4) the activity of the serum varies from one animal to another and does not increase in proportion to the number of inoculations, (5) the serum remains active for a definite time, even when the injections have ceased, (6) the serum of young rabbits born of injected females is inactive at least at the end of three weeks. (10 references, 2 tables.) J. B. Thomas.

Hessing, E. E. **Cataract due to dinitrophenol.** Arch. of Ophth., 1937, v. 17, March, pp. 513-515.

In nineteen women between the ages of 32 and 63 years, bilateral cataracts had developed after the use of dinitrophenol. Cataracts were removed from 25 eyes and in 88 percent vision of 0.8 or better was obtained. Complications before, during, and after operation are discussed and the data are presented in a table.

J. Hewitt Judd.

Krause, A. C. **Chemistry of the lens.** 8. **Lenticular metabolism.** Arch. of Ophth., 1937, v. 17, March, pp. 468-476.

An attempt is made to correlate the numerous analytic facts with the theories in order to explain the normal carbohydrate metabolism of the lens. A series of complex dynamic processes occur simultaneously and continuously in this colloidal jelly. The metabolic equilibrium is maintained chiefly by anaerobic glycolysis and aerobic inner respiration, consisting of three oxidative systems. J. Hewitt Judd.

Shropshire, R. F. **Fish-lens protein and cataract. 1. Therapeutic value.** Arch. of Ophth., 1937, v. 17, March, pp. 505-507.

This report is based on 123 patients treated with extract of fish-lens protein. Three or more treatments were given to 82, and 71 of these showed a gain and 11 showed no change or a loss. Two treatments were given to 15 patients, and of these 2 showed improvement and 13 showed no change. The other patients received from 1 to 21 injections. The results indicate that the administration of fish-lens protein is of therapeutic value.

J. Hewitt Judd.

Shropshire, R. F. **Fish-lens protein and cataract. 2. Chemical studies.** Arch. of Ophth., 1937, v. 17, March, pp. 508-512.

Experiments are described which indicate that there exists a sulphur-bearing amino-acid which has not been described previously, but which by its action as an auto-oxidizing agent is of therapeutic value. J. Hewitt Judd.

Wauters, M. **A study of glycemia in naphthalene cataract.** Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 98.

Lesions produced by naphthalene in the tissues of the eye are important because of their similarity to lesions provoked by known pathologic syndromes. In his experiments on rabbits the writer found that retinitis always preceded the development of cataract. The experiments were undertaken to

study the intensity of the internal secretion of the pancreas by estimating glycemia. The conclusion is that the internal secretion of the pancreas plays no part in the production of ocular lesions due to naphthalene.

J. B. Thomas.

10

RETINA AND VITREOUS

Agatston, S. A. **Classification of arteriosclerosis based on ophthalmoscopy.** Med. Record, 1937, v. 145, Jan. 6, p. 23.

Arterial disease is classified in three groups, using the appearance of the retinal arterioles and venules as a guide. In group 1 (peripheral arteriosclerosis) there are no fundus changes. The fundus changes found in group 2 (arteriolar disease and diseases due to changes in blood composition) and group 3 (diseases of the eye causing localized secondary arteriolar changes) are described in detail.

Edna M. Reynolds.

Balyeat, R. M. **Complete retinal detachment (both eyes).** Amer. Jour. Ophth., 1937, v. 20, June, pp. 580-582.

Berens, Conrad. **A lens for patients with detachment of the retina.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1936, 87th session, p. 274.

The author suggests frosting the correcting lens, with clear central stenopeic aperture of varying size. (One figure.) George H. Stine.

Berens, Conrad. **A retractor to be used in operations for detachment of the retina.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1936, 87th session, p. 276.

This retractor and counter-pressure spatula is made of white catalin. It may be used to protect tissues near the diathermic electrode and to remove Grable's diathermy needle from the sclera. (One illustration.)

George H. Stine.

Blobner, Ferdinand. **The action of sympathectomy in optic atrophy and in pigmentary degeneration of the**

retina. Klin. M. f. Augenh., 1937, v. 98, March, p. 289.

Testing the communications of Magitot and Löwenstein on the therapeutic value of the production of hyperemia in different diseases of the choroid, retina, and optic nerve by sympathectomy, Blobner reports six cases of tabetic atrophy of the optic nerve, one case of choroiditis with pale discs, and six cases of pigmentary degeneration, in which sympathectomy was performed. The clinical histories are given in detail. As not even transient improvement was obtained in any case, further attempts are not recommended, since the procedure is not always harmless. C. Zimmermann.

Coppez, Leon. Retinal detachment and traumatism. Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 104.

Coppez gives brief reports of 24 traumatic cases under three groups, namely, (1) perforating wounds, (2) direct contusions, (3) shocks of head and body. These were taken from a series of 115 cases treated by him surgically. Omitting four cases of deep wounds of the globe, in fourteen cases considered as not predisposed he obtained eleven cures and three failures, while in the six cases judged as predisposed he had six failures. Yet he believes it would be rash to conclude that the failures were almost inevitable because of the predisposition. J. B. Thomas.

Fritz, M. Venous pulse of hypertensive retinitis. Bull. Soc. Belge d'Ophth., 1936, no. 73, p. 132.

Two factors may concur in production of such retinitis: (a) degenerative changes of the vascular walls, (b) alterations of the circulation of the blood. Analysis of the retinal pulse registers (a) the total degree of impermeability of the entire mass of retinal capillaries, (b) the proportion of capillaries in this mass (*ensemble*) which prove to be exceptionally permeable, (c) the degree of permeability of the latter. The hypothesis of an ischemic origin of hypertensive retinitis is not verified, but it is linked to invasion of hypertension in a certain number of capil-

laries for whose walls it proves excessive. (4 figures.) J. B. Thomas.

Goedbloom, Jacques. The influence of concentrated potassium thiocyanate solutions on the structure and the volume of the vitreous body. Biochem. Jour., 1936, v. 30, Nov., p. 2073.

The behavior of vitreous toward KCNS solutions is contrasted with its behavior toward NaCl and K₂SO₄ solutions. The decrease in volume after treatment with KCNS is largely irreversible. With NaCl and K₂SO₄ solutions, the decrease in volume is completely reversible. This the author ascribes to peptization of the greater part of the vitreous proteins by KCNS, which is in accordance with the ultramicroscopic aspect of the fibrils after treatment with KCNS in higher concentrations. Edna M. Reynolds.

Goedbloom, J. Studies on the vitreous. 5. The expansive pressure of the vitreous after removal of salts. Graefe's Arch., 1937, v. 137, pt. 1, p. 127.

It was previously reported that the vitreous of cattle, when allowed to stand in distilled water for several days, increases in volume about 200 percent. The total pressure in the vitreous is made up of the tendency of the filamentary network to expand and the colloid-osmotic pressure of the vitreous. Measured with an oncometer, the total pressure gradually diminishes as the volume of vitreous increases.

H. D. Lamb.

Goedbloom, J. Studies on the vitreous. 6. The relation of mucoprotein to the vitreous framework. Graefe's Arch., 1937, v. 137, pt. 1, p. 131.

About 600 c.c. of fresh vitreous from cattle eyes was used. It was centrifuged, the overlying clear fluid filtered off, and the remaining clear mildly ropy fluid dialyzed for three days at 2°C against distilled water. The colloid-osmotic pressure of the dialyzed vitreous was then determined with the oncometer before and after addition of various solutions. Lastly the colloid-osmotic pressure of strongly compressed vitreous that had been washed

a long time in water was taken. The author concludes that the peculiarities of the vitreous in many respects are determined by the mucoprotein.

H. D. Lamb.

Hildreth, H. R. **A surgical ophthalmoscope.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 626-627.

Katznelson, A. B., and Meksina, F. M. **Clinical and pathologic anatomy of ocular changes in tuberous cerebral sclerosis.** Sovietskii Viestnik Opht., 1936, v. 9, pt. 4, p. 450.

A review of the literature and a detailed report of a case of Hippel-Lindau disease. (Photomicrographs.)

Ray K. Daily.

Kleefeld, G. **Method of exact localization of vitreous opacities utilizing the Zamenhof focalizor and the Zeiss refractometer.** Bull. Soc. Belge d'Opht., 1936, no. 73, p. 76.

The article is illustrated by figures showing the instruments in detail.

Lindner, K. **Deflected microscope for examination of vitreous and ocular fundus in the light-beam of the slit-lamp.** Deutsche Ophth. Gesell., 1936 (reprint). (See Section 1, General methods of diagnosis.)

Lyritzas, D. **Retinitis of stokers.** Arch. f. Augenh., 1937, v. 110, March, p. 382.

Two railway stokers each complained of diminished vision of the left eye. Examination revealed a central retinitis or chorioretinitis with a central scotoma. In one case the macula of the left eye showed a large round black spot, and vision was 1/4. In the other case the left macula showed a large, triangular, grayish-black spot, and vision was reduced to 1/50. The right eye was normal in each case. That only the left eyes were involved may be explained by the fact that stokers turn their left face toward the fire. The author thinks stokers should wear dark glasses as protection against injurious rays.

R. Grunfeld.

Mutch, J. R. **The Laurence-Moon-Biedl syndrome.** Brit. Jour. Ophth., 1937, v. 21, May, pp. 225-231.

The case reported is that of a male aged 35 years, showing moderate obesity, hypogenitalism and hypospadias, mental retardation, polydactyly and syndactyly, optic atrophy, and macular degeneration, together with lordosis of the lumbar vertebrae—that is, a complete Laurence-Moon-Biedl syndrome. (6 figures.)

D. F. Harbridge.

Plumer, J. S. **Retinal allergy.** Arch. of Ophth., 1937, v. 17, March, pp. 516-517.

In a man aged 35 years, with a definite allergic diathesis, transient retinal lesions were observed at the macula. No attacks have occurred since total abstinence from certain foods, indicating food allergy as the etiologic basis.

J. Hewitt Judd.

Reese, A. B. **Defective central vision following successful operations for detachment of the retina.** Amer. Jour. Ophth., 1937, v. 20, June, pp. 591-598; also Trans. Amer. Acad. Ophth. and Otolaryng., 1936, 41st meeting, p. 456.

Rieger, H. **The various forms of vitreous detachment and their observation with Lindner's deflected microscope.** Deutsche Ophth. Gesell., 1936 (reprint).

On the basis of his examination of about 350 cases of vitreous detachment from various causes, the author discusses (1) the behavior of the posterior limiting membrane; (2) three forms of vitreous detachment, namely superior, partial posterior, and complete posterior; (3) the composition of opacities found in the posterior limiting membrane of the vitreous; (4) detachment without hole formation in the limiting membrane and detachment with hole formation in the limiting membrane; and (5) the condition of the detached vitreous itself.

W. H. Crisp.

Sanctis, G. E. de. **Experimental research on nonperforating thermocau-**

terization of the sclera. Arch. di. Ottal., 1936, v. 43, Dec., p. 252.

Nonperforating scleral cauterization with the cautery at a violaceous color and for a period of one or two seconds produced effective sclerochorioretinitic adhesion. Experiments by the author also demonstrated that the globe tolerates such cauterization very well even if performed repeatedly.

H. D. Scarney.

Vogelsang, K. Macular coloboma in enzygotic twins. Klin. M. f. Augenh., 1937, v. 98, March, p. 322.

Male twins aged eight years showed well defined coloboma with abundant pigment of the maculas of the right eyes, but normal ocular movements and no nystagmus. The mother, aged 38 years, had juvenile glaucoma with deep excavation of the optic disc of the right eye; and the father, aged 38 years, had irregular pupils and marked physiologic excavation of the discs. Genealogic report of the family is given in detail. The macular coloboma was probably a malformation, as indicated by occurrence in both enzygotic twins, the correlation to the juvenile glaucoma of the mother, and lack of further foci in the fundus in the course of eight years. (Illustration.)

C. Zimmermann.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Behr, Carl. New anatomic findings in choked disc. Graefe's Arch., 1937, v. 137, pt. 1, p. 1.

The ordinary methods of dehydration of the optic nerve with alcohol are entirely unsuitable in the study of choked disc. When embedded with gelatin, the optic nerve with choked disc does not present spaces under the connective tissue septa or any loosening of the axial string of vessels as after the ordinary methods of preparation, but the signs of edema are encountered between the optic-nerve fibers. The older the choking, the more the edema extends toward the axis of the optic nerve.

Choked disc due to intraorbital growth varies considerably according to whether the tumor is intraneuronal or extraneuronal. Choked disc in tumors of the optic nerve shows more uniform swelling of the papilla and generally of greater degree, whereas the extraneuronal growth produces a maximum of differences in height at different parts of the papilla. The highest degree of swelling occurs on the side where the retrobulbar tumor presses upon the nerve stem. The back-pressure theory offers the only satisfactory explanation for these differences in intraorbital growths.

H. D. Lamb.

Blobner, Ferdinand. The action of sympathectomy in optic atrophy and in pigmentary degeneration of the retina. Klin. M. f. Augenh., 1937, v. 98, March, p. 289. (See Section 10, Retina and vitreous.)

Rieger, H. The appearance of so-called cavernous formations of the optic disc as observed with Lindner's deflected microscope. Deutsche Ophth. Gesell., 1936 (reprint).

Using the Lindner apparatus, the author had opportunity to observe two patients with so-called cavernous excavation of the optic disc in which to the author's surprise the excavated area of the disc appeared to be roofed over with a very delicate membrane.

W. H. Crisp.

Sobanski, Janusz. Value of the dynamometric examination for understanding of the origin of choked disc. Graefe's Arch., 1937, v. 137, pt. 1, p. 84.

In experiments with three dogs, only when pressure was used on that part of the optic nerve that contained the central retinal vessels did choked disc occur. When the force of compression exceeded about the mean between the diastolic pressure in the central vein and that in the central artery and approached the latter, there was no further increase of signs of venous engorgement. Choked disc occurs only when the ratio between diastolic blood pressure in the central vein and diastolic blood pressure in the central ar-

ter, normally 1 to 3, amounts to 1 to 1.5. This holds good for cases with increased intracranial pressure as well as those with considerable diminution of intraocular tension.

H. D. Lamb.

Sourdille, G. P. **Intracranial anatomic lesions in retrobulbar optic neuritis.** Arch. d'Opht. and Rev. Gen. d'Opht., 1937, v. 1, n.s., Jan., p. 3.

This extensive monograph does not lend itself to abstracting. The author concludes that intranasal (sphenoid) surgery should be done: (1) in all cases of retrobulbar optic neuritis, even recent, where an important nasal malformation is found; (2) in cases without apparent nasal lesions but where the symptomatology of the neuritis presents some character making one suspicious at once of arachnoiditis (bilateral involvement, large scotomata, frontal or posterior headache, or papillary edema); (3) in cases of neuritis in which, in spite of prolonged medical treatment, there has been no improvement. He insists on the nonspecific character of the operation, and agrees with Segura that the anatomy of the nerve predisposes to damage. (Illustrations, bibliography.) Derrick Vail.

Stewart, D. S. **Partial cavernous optic atrophy in one eye following uveo-parotid fever.** Trans. Ophth. Soc. United Kingdom, 1936, v. 56, p. 299.

Following various infections including pyelitis, phlebitis, carbuncle, and pneumonia, which had occurred within a year's time, a man fifty years old developed bilateral parotitis and three days later an acute iritis of the right eye. Six months later the vision was improved but the upper temporal quadrant of the disc was pale and deeply cupped, with corresponding loss of visual field. The author suggests that the cupping of the disc was due to damage to the cells of the inner nuclear layer of the retina resulting in absorption of the neuroglia normally bounding the physiological cup, the retinal vessels on the disc being carried outward as the nerve fiber layer shrunk.

Beulah Cushman.

12

VISUAL TRACTS AND CENTERS
Oesterberg, G. **Sagittal rupture of the chiasm.** Det oft. Selskab i København's Forhandlinger, 1935-1936, pp. 39-41. In Hospitalstidende, 1936, Dec. 15.

In an automobile accident a man of 37 years received a severe blow in the face which caused fracture of the right upper jaw and concussion of the brain. When the immediate serious symptoms had disappeared, there remained complete bitemporal hemianopsia with the line of differentiation running vertically through the center of vision. The nasal fields were normal both to white and colors, and the central vision was normal in both eyes. There was slight paralysis of the right oculomotor nerve. Both optic discs were partly atrophic throughout and sharply defined. There was complete anosmia. The symptoms are explained on the basis of a sagittal tear of the chiasm, it being suggested that compression of the skull antero-posteriorly could cause an increase in transverse diameter and thus produce the tear.

D. L. Tilderquist.

Spence, K. W., and Fulton, J. F. **Effects of occipital lobectomy on vision in chimpanzee.** Brain, 1936, v. 59, March, p. 35.

An adolescent chimpanzee was subjected to complete extirpation of the left occipital lobe, and extirpation of the posterior and lateral portions of the area striata of the right hemisphere. Removal of the entire left area striata gave a slight consistent loss of vision of from 5 to 15 percent. After the second operation, there was complete failure to discriminate a pattern sixteen times as large as pre-operatively recognizable. After the first operation there was right homonymous hemianopsia, while the second operation spared only the extreme left peripheral fields. This latter result is in agreement with other work done to show that the occipital pole of the area striata represents the macular projection area and the anterior part of the area striata around the calcarine fissure is the cortical terminus of the extreme retinal elements.

Theodore M. Shapira.

NEWS ITEMS.

Edited by DR. H. ROMMEL HILDRETH
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month

DEATHS

Dr. Francis Gabriel Miniter, Boston, died April 10, 1937, aged 53 years.

MISCELLANEOUS

Dr. Adolf Erdös of Vienna, Austria, has sent in the following news letter:

OPTIC NEURITIS IN CASES OF ANEMIA

At a recent meeting of the Vienna Ophthalmological Society Dr. A. Selmovits stated that the evidence is gradually accumulating that optic neuritis may occur as a complication of various conditions besides intracranial or orbital disease. He maintained that all or nearly all infectious diseases are capable of provoking an optic neuritis by the direct action of the toxin upon the optic nerve. The neuritis that occurs may be either a papillitis or a retrobulbar neuritis, and in the latter case the ophthalmoscopic signs may be very slight. The prognosis is usually good, but when a high degree of amblyopia lasts for more than two or three weeks, complete cure is improbable. Influenza is the most frequent cause of such cases, and next to it typhoid, malaria, mumps, and diphtheria. Cases that occur in the course of measles, scarlet fever, and small-pox are usually due to the intervention of meningitis or otitis media, which would bring them into the category of those due to intracranial diseases, but in a few published cases this can be excluded. Selmovits recently recorded the case of unilateral optic neuritis following smallpox. Most frequent is optic neuritis in syphilis as a late secondary or tertiary symptom. Neuritis and neuroretinitis occur in anemia and chlorosis also; not so infrequently as one would think. In some of the more acute cases vision is only slightly below normal during the early stages; an unfortunate circumstance, according to Selmovits, since it may prevent the diagnosis of the condition from being made until optic atrophy has commenced and the sight permanently damaged. To avoid such a calamity all cases of profound or even marked anemia should be examined ophthalmoscopically. If neuritis is found, it is necessary to exclude syphilis and intracranial growths. Failing these, the anemia itself is the probable cause. If the case is diagnosed early and treated energetically, the prognosis with regard to recovery of sight is good.

HEMERALOPIA OF PREGNANT WOMEN

A recent report issued by the obstetric clinic in Vienna shows that in the last ten years, of all

pregnant women admitted to the clinic one out of three hundred suffered from hemeralopia. According to the bulletin writer this is a somewhat high percentage. Hemeralopia usually appears in the last month. The visual acuity is otherwise normal. In no case was xerosis of the conjunctivae seen. The patients were subjected to the most minute general and ophthalmological examination. The report says that pregnancy although incapable alone of causing this condition, plays an important secondary part in its production. Two circumstances are in favor of this view: 1. The appearance of the condition in the last month of pregnancy especially, and its duration till the end of pregnancy; 2. Its rapid disappearance after delivery. It is probably caused by the production of organic troubles in the renal, cardiovascular, and hepatic systems. These cause the hemeralopia.

FOOT-AND-MOUTH DISEASE LOCALIZED IN THE EYE

A district medical officer of health in Dolna-Tuzla (Yugoslavia), Dr. A. Breiner, described the case of foot-and-mouth disease localized in the eye. The patient was a peasant dealing with the breeding of cows and swine. He sought relief only when the disease was very much advanced and when he had seen that the disease might cost him his eyesight. The affection began with conjunctivitis and a fairly severe ciliary injection. The cornea was free. The inner third of the superior palpebral margin suppurred and was covered with a semiadherent membrane. Both the eyelids were markedly edematous, and there were large, firm, slightly sensitive glands below the angle of the chin and in the neck. Treatment consisted of lavage with corrosive sublimate in a solution of 1:4000, and the application of a solution of collargol 1:200 every hour. Within a fortnight the eyes and mouth healed as well as the cutaneous nodules. The enlarged submaxillary glands disappeared only after the lapse of a month's time. Recovery was complete.

PROPHYLAXIS AGAINST BLENORRHEA NEONATORUM IN ROUMANIA

In 1900 a law was enacted in Roumania compelling every midwife to instil silver nitrate into the eyes of infants at birth. It must be remembered that for about ten years midwives have assisted at almost every delivery in Roumania, with the exception of some remote villages in Bessarabia, and it rarely occurs that only a doctor is in attendance. Training for midwives is very thorough in Roumania, taking

one complete year. The population of Roumania is over 18,000,000. The incidence of the disease has been reduced to two or three cases yearly. The Public Health Board is hopeful of improving even on this. They accentuate in their follow-up circulars to midwives that prophylactic measures cannot prevent a later infection after birth, when the case has passed out of the control of the midwife, and it is the duty of mothers to be on the watch.

In regard to the strength of the solution to be applied, the experience of the village doctors and district physicians was that after the use of two-percent silver nitrate occasionally severe reactions followed: conjunctival hyperemia or catarrh (the so-called silver catarrh) and even hemorrhages from the conjunctiva, and corneal haze. Hence it is not always wise to employ a two-percent solution of nitrate of silver, inasmuch as a one-percent solution is of sufficient strength. Nevertheless the pertinent law prescribes the instillation of a 1.5-percent solution. For doctors, hospitals, and obstetric clinics it is allowed that wherever the suspicion of infection can be positively excluded, milder measures, for example, washing the eyes and flushing them with a saturated boric-acid solution, are sufficient.

At the recent Annual Congress of the Medical Section of the Transylvanian Museum Society Dr. Emile Grósz, professor of ophthalmology at the University of Budapest, late president of the International Campaign Against Trachoma gave a lecture on some of the problems of ophthalmology.

HEREDITY

In the field of researches the problem of heredity stands in the foreground. That single diseases may descend from generation to generation has long been known. Nettleship discovered the inheritance of hemeralopia in a study of 2121 individuals. The practical consequences of this fact have been recognized, however, only in recent years and have attracted special interest only since the German imperial law introduced compulsory sterilization. Compulsory sterilization came in force in the German Reich in 1933. The law chiefly concerns mental patients, whose number is estimated to be about one million; over against this the number of congenitally blind persons is very low, about 10,000, and the greater part of these do not marry. In civilized countries the number of blind people is on the decrease, particularly those blinded as a result of blenorhea and smallpox. With hygienic, economic regulations, this rate could be still further diminished. Results from the sterilization are anticipated but what has been obtained so far is by no means what had been expected. Ocular affections indicating sterilization in Germany are: aniridia, which usually is associated with other phe-

nomena, namely, macular aplasia, nystagmus, opacity of the lens and cornea, microphthalmus, and glaucoma. Family trees extending over several centuries bear out heredity. In spite of this every single case requires careful consideration. Ptosis, which is as well an inherited affection, calls for sterilization, though this is scarcely justified.

The hereditary character of senile cataract is well known, but this disease makes its appearance at an age when we need not fear its inheritance.

Short-sightedness is undoubtedly inheritable, but is no ground for sterilization; however, the marriage of couples suffering from advanced myopia ought to be prevented, for the offspring are likely to inherit the affection.

The difficulty of this problem is best shown by inherited atrophy of the optic nerve, established by Leber. This affection makes its appearance at the age of 20 years, usually in men, but it is not these through whom it is inherited, but women. The sterilization of men would be useless; the sterilization of healthy women, however, is not allowed even under the German law, although out of the women of 20 family trees 90 were conductors.

The annual meeting of the Advisory Board for Medical Specialties which is the coöordinating board for the twelve certifying boards in the various specialties, the Association of Medical colleges, the American Hospital Association, the Federation of State Medical Boards of the U.S.A., and the National Board of Medical Examiners was held at Atlantic City, June 6, 1937. The following officers were elected: Willard C. Rappleye, M.D., President, New York City; W. P. Wherry, M.D., Vice-President, Omaha, Neb.; Paul Titus, M.D., Secretary-Treasurer, Pittsburgh, Pa.; W. B. Lancaster, M.D., Boston, Mass.; R. C. Buerki, M.D., Madison, Wis. Dr. Louis B. Wilson, Rochester, Minn., the retiring president of the Board, was elected an emeritus member of the Board. Representatives of American Board of Ophthalmology placed on the Advisory Board were Dr. W. B. Lancaster, Boston, Mass., and Dr. John Green, St. Louis, Mo.

SOCIETIES

The North Dakota Academy of Ophthalmology and Otolaryngology held its nineteenth annual meeting at Grand Forks, on May 17th. An illustrated address was presented by Dr. Arthur E. Smith of Los Angeles on "Reconstructive and plastic oral surgery." Officers elected were Drs. H. Rosenberger, president, of Bismarck, and F. L. Wicks, of Valley City, Secretary.

The 15th annual dinner of the Brooklyn Ophthalmological Society was held at the Hotel Bossert on Thursday, May 20, 1937. Dr. P. Chalmers Jameson was the guest of honor, and

in recognition of the esteem and affection of his fellow members, was presented with a wrist-watch. Drs. Arnold Knapp, James W. White, and James H. Andrew paid tribute to his outstanding contributions to the science of ophthalmology. Dr. Jameson has been in active practice for forty-five years, and in a few months will be seventy years old.

The following officers were reelected for the ensuing year: president, Dr. Walter V. Moore; vice-president, Dr. E. Clifford Place; secretary-treasurer, Dr. Mortimer A. Lasky; associate secretary-treasurer, Dr. Allen Hull.

The sixteenth annual session of the American Congress of Physical Therapy will be held in Cincinnati, September 20th to 24th inclusive.

The Mississippi Valley Medical Society (Headquarters, Quincy, Illinois) has recently established a number of annual awards in an effort to expand the influence of the organization. These are as follows: 1. To encourage recent medical graduates to become interested promptly in postgraduate study, the Society will award each year five free memberships to recent graduates from each of the recognized medical schools of Illinois, Missouri, and Iowa. These memberships will be good for two years and will be determined by the deans of the respective schools on the basis of school scholarship, it being required that the appointees be licensed to practice medicine in Illinois, Mis-

souri, or Iowa. 2. A silver and a bronze medal will be awarded each year for the most interesting scientific exhibits at the annual meeting. 3. A cash prize of \$100.00 and a gold medal will be awarded annually for the most interesting contribution to be submitted on a subject determined by the Annual Awards Committee. This contribution must be of interest to the physician in general practice and the winner will be invited to present it before the Society at its annual meeting. 4. The Society has also under consideration the annual award of a gold medal to one of its members for distinguished service rendered the profession. This will be determined by the Board of Directors at its next meeting (September).

PERSONALS

Dr. Fred Tooke has recently been appointed to the Chair of Ophthalmology at McGill University.

Dr. C. E. Beeman announces the association of Dr. J. W. Phillips, recently of the Department of Ophthalmology, Bellevue Hospital, New York City. Practice limited to ophthalmology; Medical Arts Building, Grand Rapids, Michigan.

Dr. W. W. Blair, professor emeritus of ophthalmology at the University of Pittsburgh has retired from active practice. He was given a dinner in his honor by forty of his confrères at the Pittsburgh Field Club on May 18th.